Tech
F

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania;

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

EDITED
BY THOMAS P. JONES, M. D.

PROFESSOR OF CHEMISTRY IN THE MEDICAL DEPARTMENT OF THE COLUMBIAN COLLEGE, AND LATE PROFESSOR OF MECHANICS IN THE FRANKLIN INSTITUTE, AND SUPERINTENDENT OF THE PATENT OFFICE AT WASHINGTON.

VOL. VI.

Vol. 10

NEW SERIES.

PHILADELPHIA:
PUBLISHED BY THE FRANKLIN INSTITUTE, AT THEIR HALL;
THOMPSON & NOMANS, WASHINGTON CITY; G. & C. CARVILL, NEW YORK; AND MONROE & FRANCIS, BOSTON.
J. HARDING, PRINTER.

1830

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

JULY, 1830.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN APRIL, 1830.

With Remarks and Exemplifications, by the Editor.

1. For an improvement on a *Machine for Spinning Cotton*, known by the name of "Danforth's Patent Throstle;" Charles Danforth, Patterson, New Jersey, April 1.

The machine upon which this is an improvement, was patented September 2nd, 1828, and in our list is denominated an "Improvement in the Construction, Manufacture, and management of the Bobbins and Flyers for Spinning Cotton." We did not publish any account of the plan of this apparatus at the time, from the wish of the patentee that it might be delayed, as he then contemplated securing his right in Europe, which a publication here might have defeated.

On the 31st of March, 1828, a description of some improvements in spinning was received at the patent office, from Mr. John Thorp, of Providence, Rhode Island, and a patent for these improvements was subsequently obtained by him. The description referred to will be found at page 41, of the last volume. The patent obtained by Mr. Danforth, in September, 1828, was for an improvement bearing a strong resemblance to that described, and afterwards patented by Mr. Thorp; Mr. Danforth has obtained the present patent for a further improvement on his first mode. We shall not attempt to enter into particulars respecting the arrangement devised by Mr. Danforth; its general object will be understood by the re-

ference already made; more would require drawings. The question of who was the first inventor is one which we are not prepared to discuss, as it belongs to another tribunal.

---

2. For a mode of making *Woollen Roping, or Slubbing*, by the "Spiral Slubbing Machine;" Austin Steele, Waterbury, New Haven county, Connecticut, April 1.

The main cylinder, doffers, combs, and small rollers, in this machine, are represented exactly like those in the drawing accompanying Mr. Charles Atwood's specification, page 378; but instead of the tubes between the doffers and small rollers, the wool, as it is separated by the combs, is received upon a short revolving apron; it passes along this apron, across which "is another apron, or belt, which presses upon and revolves on the said web, and rolls, or twists it; or a roller, working obliquely, may be used for the same purpose. The effect produced by the motion of the upper apron or roller, is to twist or roll up the roping or slubbing spirally." The claim is to "the mode of making woollen roping, or slubbing, by rolling it up spirally, as above described." Mr. Atwood refers to this mode of rubbing, and objects to it, as producing a degree of felting injurious in the subsequent operations upon the slubbing, and upon the fabric manufactured from it; so far as we may be allowed to judge without experience, we are inclined to prefer Mr. Atwood's plan.

---

3. For a machine for *Thrashing all kind of Grain*, called the "Paragon Thrashing Machine;" William C. Ross, Penfield, Monroe county, New York, April 1.

The novelty and merit of this machine depend upon the "placing the apron on an inclination, and reducing the motion of the main, or thrashing cylinder, and consequently reducing friction, &c."

The main cylinder is of wood, covered with iron, or furnished with six beaters, also covered with iron, to protect them against wearing.

"The improvements relied on in this machine, are, in adding to the diameter of the main cylinder, consequently producing the same effect with half the revolutions, thereby reducing the friction, which the *inventor* considers the most *discriminating* feature of its utility; in the inclination of the apron; and in the *conciseness* of the machine and its appendages. I therefore claim all the above improvements, together with the privilege of varying the dimensions and proportions of the improved thrashing machine, as my fancy may from time to time hereafter dictate, so that all the while I adhere strictly to my principle, and depart not from it." Which *principle* is the making the cylinder twice as large as one of half the diameter, and *inclining* the apron by which the machinery is fed.

---

4. For improvements in the *Machine for making Dipped*

Candles; Thomas M. Scott, Falls Township, Bucks county, Pennsylvania, April 1.

The specification and accompanying drawing give a clear view of the mode in which the frame is to be constructed, for holding the rods upon which the wicks are to be placed; also the manner of placing the wicks, heating the vat, and managing the dipping. The patent is not taken for an individual improvement, but for a general system, the explanation of which would require the drawings. It is calculated for a large manufactory only, and in this age of lamps and mould candles, we apprehend that but few persons will feel a particular interest in the subject.

---

5. For an improvement in *Horse Shoes;* Sumner King, Sullivan, Madison county, New York, April 1.

The improvement designated is the making the caulks, or projections, moveable, instead of permanent; for this purpose the shoe is to be formed with an opening or mortise in the toe to admit the moveable caulk to slide in, when it is to be secured by a bolt, or screw and nut. "The hinder caulks may be fastened on in the same way, or they may be permanent."

"The caulks can be cast, or made of steel or iron, or any other metal."

"What I claim as my invention, is, the making of moveable caulks, or projections, for horse shoes, whether made of cast or wrought iron, or of any other metal as above described."

---

6. For a *Self-operating Temple;* Ephraim R. Otis, Lyme, New London county, Connecticut, April 2.

(See specification.)

---

7. For a machine for *Sawing Shoemakers' Lasts and Hat Blocks;* Seth Carsley, 2nd, Harrison, Cumberland county, Maine, April 2.

"This improvement in making shoe lasts and hat blocks, is a circular saw and a vibrating carriage, placed above a slide carriage; and an index and pattern, which govern the action of the saw upon the work; and a feeding screw which moves the slide carriage."

The foregoing is the whole of the specification, with the exception of three or four lines of reference to the drawing; the latter, however, is tolerably descriptive, and by the joint aid of imagination and invention, an idea may be formed of the structure of the machine.

This saw, we are led to suppose, is to operate as a rasp, or gouge, in roughing out a block; the block and saw are both made to revolve. The *guide* is in the shape of the article to be produced, and is made to revolve against what is rather strangely called the index, as it is a round wheel fixed to a sliding frame, which it causes to move so as to carry the block to be formed, against the saw, agreeably to the shape of the pattern.

8. For an improvement in *Propelling Boats;* Timothy Beach, Wilmington, Clinton county, Ohio, April 2.

We scarcely know how to designate the *improvement* in propelling to which the foregoing title alludes. We may safely aver, however, that in the multitude of devices which have entered into the heads of schemers, with and without brains, there is not one less feasible than this, excepting it be such as are constructed on the principle of the "upward forces of fluids," or some other equally allied to perpetual motion.

Tubes of metal are to pass through the water from the forward part to the stern of the boat, there being one on each side, as low down as the keel. These tubes turn upwards at the forward part of the boat, and open into a steam chest, connected with the boiler; into these tubes steam is to be alternately admitted, and cut off, by a sliding valve. When the steam is admitted, it is to drive the water out of the tubes, and propel the boat; when the steam is cut off, the water is to re-enter in readiness to be again ejected, *secundem artem.*

The claim is to "the application and construction generally of the above described machine."

---

9. For *Chain Paddle Wheels;* Andrew Rodgers, Middletown, Dauphin county, Pennsylvania, April 6.

Among the early attempts in constructing propelling machinery, plans precisely similar in principle, and in arrangement nearly the same, with the present, were devised and essayed. An endless chain in the middle, or one on each side of a boat, is to be made to pass from stem to stern by the revolution of wheels, around which they are strained. Between each joint of the chain is fixed a bucket, or float, in order that a row of them may act upon the water, horizontally, at the same time. The construction of the chain, the wheels, and other parts, in the present plan, manifest much skill, but still we see nothing in it which can secure to it the character of novelty, or remove the difficulties which have heretofore caused this mode of propelling to be abandoned.

The claim is "the construction of chain paddle wheels for propelling boats, as herein described."

---

10. For an improved mode of *Manufacturing Pill Boxes;* Nathan Crary, of Knox, and Edward P. Crary, of Bern, Albany county, New York, April 6.

We are not acquainted with all the modes adopted for making pill boxes, but those described in the present patent are so simple and obvious in their character, that we should apprehend that they, or others equally good, must have been long known and practised. Cylinders of wood are used for making round boxes, and their covers, and oval formers for those which are to have that shape; round these the chip is bent for the purpose of glueing it. These moulds are to

be made true by forcing them through round or oval holes in a steel plate prepared for that purpose. Blocks of wood, with wedge shaped channels are used to retain the bodies in their places whilst the glue is drying. A cutting gauge is employed to divide the glued pieces into proper widths.

This is the whole amount of the patent, and as no claim is appended to the specification, all the modes described must be considered by the patentees as constituting it.

---

11. For an improvement in the *Machine for Weaving Rugs and Carpeting;* William Bacon, Philadelphia, Pennsylvania, April 7.

Without a drawing it would be in vain to attempt to describe a loom of almost any kind; and, in the present instance, although the drawing is well executed, it does not appear to us that the construction and operation of the machine are given with sufficient clearness. The object proposed is to weave rugs and carpeting, not only of the ordinary width, but also without seam, sufficiently large for a room.

The loom, as represented in the drawing, is so constructed that the carpet to be woven stands in an oblique position. Its operation of weaving is thus described. "The chain is put on the yarn beam in the usual way, over the top rail, and through the gears and reeds; from thence extended, by lines, to the cloth beam. The treadles are pressed down, which open the chain, and the filling put in by the needles, one thread at once; the plush is then put in by the proper needles, one for each colour, and worked to any required figure. For this purpose the figure is first divided into small squares, and the colours are then worked so as to correspond with the squares. In this way a carpet of any size, with a border worked in, may be made to fit any room, without seam, and to fit the fire-place and different recesses of the room."

"The roller for the gears is two or three feet long, for one person to work at. There may be any number of rollers, according to the size of the carpet, and number of persons employed."

"*Invention claimed.*—What I claim as my peculiar invention, is, the construction of the before described machine, by which rugs and carpets can be worked to any size and figure, without seam, and to fit any room."

It will thus be seen that the whole machine is claimed, without any reference whatever to any particular arrangement of its parts, although these parts are, in general, similar to such as are found in other looms. To sustain such a claim, the whole construction ought to be new.

---

12. For a machine for *Cutting Mouldings in Wood by Rotary Motion;* Samuel Kennedy, City of New York, April 10.

We are told that "the principle of the rotary moulding cutters, is the forming of mouldings, such as are used by carpenters, frame

makers, and others, by a rotary motion; previous to this the way was always to stick with planes by hand."

The claim is to the wheels used with irons or cutters to form or cut one or more mouldings on one or both sides of the board at the same time; the cutting wheels for the purpose of producing mouldings being considered as entirely original.

A similar machine has been regularly at work in New York ever since December, 1828, at which time a patent for it was granted to Mr. William Woodworth, of that state, who has since established them in other places. An account of this machine will be found at page 199, vol. iii. new series. It has been used principally for the planing, tongueing, and grooving, of flooring boards, but the "cutting into mouldings, either plank, boards, or other material" is mentioned in the title, and is distinctly designated; in the claims made, "the application of cutter wheels" for "cutting mouldings in wood, stone, metal, or other material," are among the terms used. We see nothing in the present machine differing in principle from Mr. Woodworth's, or which, in our estimation, can be called an improvement upon it.

---

13. For a tool called a *Screw Swedge, for Cutting or Forming the Screw Thread in Brass, Iron, Steel, or other Metal;* Richard Whitney, Baltimore, Maryland, April 10.

This patent is taken for the forming of screws on "common screw-bolts, wood screws, and all other purposes for which it is necessary that the screw thread be cut thereon; and an easy method of forging the nuts to be used with said screws after they are thus formed, or made in the old way, with a plate; the aforesaid tool answering all the purposes of common screw plates now in use."

The tools for which this patent is taken are very clearly described, and distinctly represented. There must be a pair of swedges made, one of which may fit into the eye of the anvil, as usual; the upper swedge should have a proper handle and a guide to insure its standing correctly over the lower. In each of these swedges one-half the intended screw is to be sunk just as they are in the dies in screw stocks. The heated metal is to be placed between these, and the screw formed in them by forging. The thread may be angular, or square, as may be desired.

For some purposes this contrivance will undoubtedly answer, but it must be for very common purposes. The stretching, or lengthening of the screw, produced by the common stocks, and especially by the screw plate, which is so injurious to those screws which are intended to work in deep nuts, will be produced in a much greater degree by the proposed plan, excepting in those instances where the length of the screw is not greater than that in the die.

To talk of forging screws of brass in such tools may do for one who has never essayed the working in that metal; we are assured that no worker of brass will violate this part of the patent. We

know that screws might be so cut upon small, cold, brass wire, but we also know that it would be very far from an improvement.

The method prescribed for forging the nuts, is to make them in the usual way, punching the hole sufficiently large to pass over the tap, then to heat them, and forge them on the tap, by striking carefully on their square edges, so as to bring up the thread. Such nuts, if they are to be neatly finished, will require more labour in filing their sides than would have been necessary to cut a good screw with a tap.

---

14. For an improvement in the *Iron Dogs for Saw Mills;* Anson Andrews, Spencer, Tioga county, New York, April 10.

On February 19th, a patent was issued to Mr. Rich, of Condor, Tioga county, bearing the same title. The general form of the dogs is also the same in both cases; in the present instance one of the dogs, or half bails, is made to slide upon a square bar of iron upon the head block, being furnished with eyes for that purpose. There is a regulating screw to set it in its place, and there are graduations upon the iron bar, by which to gauge the thickness of the stuff, and some other appendages, that we do not think it necessary to describe, but that are alluded to in the claim, which is as follows.

"The graduation of the iron bar, upon which the half bail slides, for setting, or gauging the thickness of the lumber; the screw passing through the circular part of the half bail, by which it is moved to and fro; the circular slide; the manner in which the perpendicular bar of iron is attached to the tooth upon the upright part of the bail; the screw passing through the circular slide, and fixed to the said iron bar; the manner in which the teeth are set; and the angle dog."

---

15. For a *Churn;* Isaac F. Waring, Columbia, Hamilton county, Ohio, April 12.

The dasher of a common churn is to be worked up and down by the aid of a crank and a fly wheel. There is no claim. The description is itself a nondescript, and is attended by a corresponding drawing; the *invention*, or *discovery*, is a nonentity, and the whole, therefore, in perfect keeping.

---

16. For an improvement in the *Machine for Thrashing Grain;* James Cooper, Augusta county, Virginia, April 10.

Most of the usual appurtenances of a thrashing machine are found in this, but instead of the hollow segment generally employed, there is an "elastic thrashing cover, or floor," which is formed of slats of wood, placed side by side, and covering the whole length of the cylinder over the beaters; upon these elastic slats springs are made to bear, and between them and the beaters the grain to be thrashed is conducted by the feeding rollers. The claim is to the elastic cover, or floor.

17. For an improvement in *Dogs used in Saw Mills;* Joshua Pierce, Joseph Whitley, and Aaron Whitley, Condor, Tioga county, New York, April 13.

We dare say that this is a very good dog, capable of holding fast, as his teeth appear to be well formed for the purpose. Like No. 14 of the present list, and No. 29 for February last, it is of the Tioga county breed, and is manifestly a mere variety of the species before described, as will be seen by the characteristics that distinguish him in the claim, which is "the *graduated sliding gauge*; its fixture to the dog; its movement by the *screw;* and the *bracing hand.* We also claim the *screw*, and *horizontal movement in* the right hand dog; its fixture to the dog; and the bracing hand as above described."

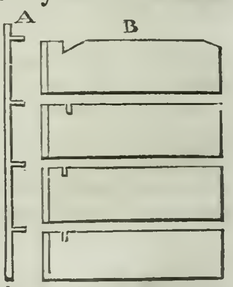
---

18. For a mode of *Locking Drawers of Furniture*, called the "Saving Lock;" Elijah Skinner, Sandwich, Strafford county, New Hampshire, April 13.

What is claimed as new "is the attaching of such slides, staples, pins, &c. to the drawers and furniture, that with one common drawer lock I can lock and unlock any number of drawers in the same piece of furniture, in an easy and cheap manner."

The mode is by causing the lock of one drawer in a tier, or case, to operate in various ways upon a slide extending from the top of the case to the bottom, and furnished with pins or staples to catch upon corresponding parts on each drawer.

It may be that to the patentee this is a novelty, but we can inform him that it has been long known and used. The neatest and most simple mode of effecting it which we have seen, was in two nests of drawers, making part of the stand of a lathe manufactured by Dyerleine and Hoptzaffel, of London, and purchased by us in Philadelphia, in the year 1817. A strip, of which A is a side view, was placed in a groove on the inside of the case, so that it could slide up and down freely at the ends of the drawers; a number of iron pins projected from this strip, so that one might fall into a notch in each drawer. The upper drawer was furnished with a lock; when this drawer was unlocked, and drawn out about an inch, it raised the slide, by the inclination of the notch in the upper drawer, as shown at B, and relieved all the other drawers. This lathe was afterwards sold to Professor Gibson, of Philadelphia, and is probably still in his possession. We have since had the same principle applied to side board, and other drawers.



---

19. For *Revolving Bar Temples*, to be used in weaving; Edward B. Harris and Andrew R. Arnold, Woodstock, Windham county, Connecticut, April 13.

These revolving bar temples are to take hold of the selvage of the

cloth by rows of pins projecting from wheels turning upon pivots. These wheels are fixed in stocks having a horizontal and vertical motion, so as to adapt and fix them in any proper position. In the specification these revolving temples are named as though they were altogether new. Such, however, have been long in use, and secured by patent. In the finer fabrics they were found to leave holes, which, as they did not entirely disappear in the subsequent dressing, was in many cases a serious objection to them. For some improvement upon them, intended to obviate this difficulty, another patent was obtained. We have not now time and opportunity to examine these patents, but have a perfect recollection of the facts which we have stated.

---

20. For an improvement in the *Iron Dogs for a Saw Mill;* Martin Rich, Candor, Tioga county, New York, April 13.

"The dog star rages," at least in Tioga county, New York; these dogs, however, are not affected with hydrophobia, as without abundance of water they would remain in a state of quiescence. Mr. Rich obtained a patent for a dog of an improved breed, in February last, since which two, or rather four of his neighbours, have become his competitors, as we have already noticed; he now comes forward with another dog, which we are informed will retain his hold upon a log of wood, without letting go, after once his teeth have been made to enter it.

In the dogs patented by Mr. Andrews, No. 14, one of the half bails is made to slide endways upon a square iron bar attached to the head block on one side of the kerf, the bar itself turning on pivots in staples driven into the block. In the present patent, each bail is to be so fixed, that the log may be shifted without loosening the dog. The iron bars are cut into notches, or teeth, on one angle, and into these notches springs fall, to hold the bails in their places. A spring attached to one of the bails falls into notches upon a strip or bar of iron fastened to the block, at the back of the dog, to aid in gauging the thickness to be cut. These parts are not very clearly described; the drawing, however, is sufficiently well executed, but it is entirely without written references, and thus fails in an important point. We are not told for what the present patent is taken, although the new and the old are manifestly mixed up together in the description.

---

21. For an improved *Reacting Water Wheel;* George W. Henderson and John E. Cayford, Milburne, Somerset county, Maine, April 14.

We are not of opinion that wheels moved by the reaction of water, on the principle of Barker's mill, will ever be made to produce effects at all equivalent to the quantity of water which they consume. Many patents have been obtained for wheels of this description, usually by persons ignorant of the principle upon which they act,

and therefore incapable of forming a correct judgment of the effect of any new modification of it. We are not aware of any material difference between the wheel now patented, and some of its predecessors. The water is to be delivered through six, or any other number of openings on the periphery of a horizontal wheel, supplied by a vertical shaft, in the usual way; the fluid being conducted to the openings by spiral partitions or floats, so placed as to deliver it in a tangent to the periphery. "What we claim as our improvements," say the patentees, "are setting the floats so as not to project by each other, or, if there are six floats, each float is no longer than one-sixth part of the circumference of the wheel; the floats being thin curved sheets, and fastened to the circumference of the bottom and top." There are some other trifling claims, such as the gudgeon on which the wheel runs; the fastenings used; the applying the reaction wheels to a horizontal shaft, and other things *equally novel.*

---

22. For apparatus for *Grinding and Rubbing down hard Substances;* Barton N. Fyler, Bradford, Orange county, Vermont, April 15.

(See specification, page 235, of the last volume.)

---

23. For a *Machine for Manufacturing Pipes for Aqueducts, &c. &c.;* Thomas B. Armistead, Bloomfield, Ontario county, New York, April 15.

The said machine is merely a common rack and pinion press, to force clay into moulds for forming tubes of earthenware, for the purpose, we are told, of conveying water or gas, making candle moulds, *worms for distillers*, tiles, and all kinds of earthen and stone ware. Although there is no novelty in the machine which is patented, there is much in the idea of making candle moulds and still worms of earthenware, the latter especially; hitherto it has been thought desirable to use metals for this purpose, as being the best conductors of heat, *mais nous avons changé tout cela*, and it is proposed, hereafter, to employ one of the worst conductors, and one, moreover, which may be broken with the utmost facility. As is usual, and proper, when patents are taken for machines which are old, there is nothing claimed as new.

---

24. For a *Washing Machine;* Richardson P. Clarke, Montgomery county, New York, April 16.

The description of this machine occupies six closely written pages, and is accompanied by a well executed drawing. To give an analysis of it, would be merely mill-horse labour, and really we are not fond of going round in the same circle which we have already and repeatedly perambulated. We may be the more readily excused for forming this determination, as, like the machine mentioned in the last article, there is no claim made to any part of it.

25. For an improvement in the process of *Manufacturing Raw or Brown Sugar*, &c. &c.; William A. Archbald, City of New York, April 19.

---

26. For an improvement in the process of *Manufacturing Raw Sugar from Cane Juice;* William A. Archbald, City of New York, April 19.

---

27. For an improvement in *Manufacturing Raw or Brown Sugar*, by improving it after it has been granulated, &c.; William A. Archbald, City of New York, April 19.
(See specifications.)

---

28. For *Manufacturing from Wool, Pantaloons, Stockings, Drawers, Wrappers, Petticoats, Vest Bodies, &c.*, without the process of spinning and weaving; Jesse Foster and James Stoughtenburgh, Greene county, New York, April 20.
(See specification.)

---

29. For an improvement in the mode of *Taking the Figures of Ingrain Carpets from the Cloth;* William Sherwood, Somerworth, Strafford county, New Hampshire, April 20.
(See specification.)

---

30. For a *Churn;* Asael Curtis, Paris, Oneida county, New York, April 20.

The churn is to be an upright square box, with two dashers, each formed of blocks of wood, filling about one-half of the capacity of the box; the handles are to pass through holes in the top, and to be worked by hand, or in any other way which the purchaser of a right may prefer; there is no claim, not even to the making the churn square.

---

31. For an improved *Water Wheel;* Paul Boynton, Oswegatchie, St. Lawrence county, New York, April 20.

This is a propelling wheel, similar in its action to a great number which have been devised to cause the paddles to act vertically in the water, and differing but very little in the arrangement of its parts from several of them. Two wheels, or rather sets of arms, are made to run somewhat eccentrically; connecting pieces from the arms, or periphery, of one, acting upon the buckets, as cranks, to give them the desired position.

This wheel has the merit of being less complex than some of its fellows, but the disadvantages which must attend the multiplication of joints, even in the most simple of these plans, will, we apprehend,

cause this, as it has many others with vertical paddles, to be, on the whole, inferior to the common wheel.

---

32. For an improvement in the *Steam Boiler;* Henry M. Shreve, Louisville, Kentucky, April 21.

This boiler is a cylinder placed vertically, and it is proposed to make it 25 feet long, and forty-five inches in diameter. This we are informed is the size of two which have been constructed and used. A proper furnace is fixed under the boiler, and sixteen flues, each seven inches in diameter, pass through the lower head, and up through the water, to the height of twenty feet; they then pass out through the side of the boiler into a heated air chamber, formed by an iron casing which surrounds the cylinder; the heated air is made to descend between the outside of the boiler, and this iron casing, which is lined with fire clay; the depth of the casing is seven feet 6 inches; two chimnies rise from its lower edge, and conduct off the smoke to a convenient height. The steam pipe, safety valve, and gauge cocks, are placed in the upper end of the boiler, above the termination of the flues.

The patentee says that two such boilers were placed on board the steam boat La Fouche; that the saving in fuel was one-half, and the room occupied on deck not one-fourth, of that usually required. "The risk of the loss of lives and the destruction of a boat, from explosion, is believed to be entirely removed; the upper head of the boiler being the weakest, must give way first, and in case of explosion, the contents will be thrown perpendicularly into the air, where it will be too much cooled before its descent to do any injury, even when passengers are not protected by an upper deck."

The claim is to the passing the flues through the lower end of a boiler, with an immediate escape at any point below the upper end, or with a re-descent along its outer surface when standing in an upright position.

---

33. For an improvement in the *Cast Iron Plough;* Derick Barnard, Washington, Sussex county, Delaware, April 21.

The plough is to be cast in parts in a manner directed in the specification, and by which the patentee considers that many advantages are secured; such as lightness, strength, and several others. This is intended as an improvement upon a plough formerly patented by the same person, and he now thinks "the plough as near perfect as it is possible to construct one upon the present principle." We have not examined the former patent, and are not, in the present, informed what that principle is.

---

34. For an improvement in the *Saw Cotton Gin;* Phineas Gardner, Woodville, Wilkinson county, Mississippi, April 22.

Instead of one gang of circular saws, there are two, one placed

below the other, and working in the intervals between each other, and between openings in the grate-fall, in the usual way. The claim is to "the use of the two saw cylinders, as above described, wherein the saws of each work in the openings of the other, and whereby the cotton is better ginned, with less power than in the usual mode."

We do not see upon what principle the benefit claimed can be produced by this arrangement. The number of saws is the same as in the old machine, and two cylinders are to be driven instead of one, giving the extra friction of a strap and a pair of gudgeons.

---

35. For a *Machine for Washing Clothes;* Hezekiah Thurber, Painted Post, Steuben county, New York, April 22.

A box, rectangular within, and having its sides formed of slats, placed at a distance from each other, is to be turned by a crank, in a water tight trough; into the interior box, the clothes are to be placed, with round balls of wood, to aid in rubbing them; the soap suds is to be poured into the exterior box, or trough. The crank is then to be turned with an irregular motion, and the clothes allowed to fall from side to side until they are cleansed.

The claim is to "the construction and combination of the several parts of the before described machine, and the manner of using it.

There could not well be any thing less definite than this claim, yet we do not perceive how it could have been made more so, as the pigeon holes of the patent office are replete with similar contrivances. "The manner of using it," is, we suppose, the putting the clothes inside, and the turning of a crank; a procedure equally novel with "the construction and combination of the several parts."

---

36. For a "*Self-moving Ink Distributor;* John Prince, City of New York, April 23.

A patent was obtained by Mr. Prince, for an apparatus for the same purpose, on the 3d of December last, and is noticed in the March number of this Journal. There appears to be a strong similarity between the two plans, as in both the spring which gives motion to the inking roller is wound up by the turning of the rounce. We are surprised that no reference whatever is made to the former patent, upon which the present seems to be merely an improvement; in this case the improvements should have been particularly designated, and the present patent taken for them only. Two patents, of different dates, must not occupy the same ground, or a man might extend his right for an indefinite period of time. In the present specification, there is no claim whatever made, the whole apparatus being merely described, and no part particularized as the subject of the patent; in the former, the claim was very distinctly and clearly set forth, as may be seen by reference to page 156 of the last volume.

---

37. For a *Machine for Boring Holes in Rocks;* Israel Overall, Liberty, Smith county, Tennessee, April 23.

A frame is made consisting of a sill, two uprights, and a cap piece,

so as to resemble a frame for a door, or gate; an auger is fitted into a socket in an iron rod, called the driver, this is placed to stand vertically in the middle of the frame, the sill being perforated to allow the shank of the auger to pass through it, and the upper end of the driver being secured in its position by means of a screw and nut, which affix it to a wooden spring, running along under the cap piece of the frame, and extending its whole length; this spring is so attached at its ends to elastic sliding pieces, that it may be lowered by means of slots in the uprights, and follow the auger as it descends; pieces called supports, are attached to the frame to set and keep it upright.

The claim is to "the construction of the whole of the above described machine, except the auger, or bit."

---

38. For a composition of matter for *Making Boots and Shoes of all kinds Impenetrable by Water;* Samuel Eells, 2nd, Middletown, Middlesex county, Connecticut, April 25.

The principal use of the composition designated in the above title, is to render *cloth* water proof, which cloth may be placed between the upper leather and lining, and also between the soles of boots and shoes; we, however, are informed, that "a piece of tarred cloth put between the soles will answer the same purpose."

Without giving the recipe, we may state, that it consists of materials which have been repeatedly used for the same purpose, such as India rubber, turpentine, linseed oil and bees wax, dissolved together, and rendered drying. This composition may be applied either to cloth or to leather; in the latter case it is used in a more diluted state than in the former, and rendered less drying.

---

39. For an improvement in the *Art of Distilling;* Charles F. Fisher, York, York county, Pennsylvania, April 23.

A small doubling still of the capacity of 32 gallons is placed over a common still of from 110 to 120 gallons. The vapour from the beer in the latter, ascends through a tube into the upper still, where there is a contrivance called a separator, which is perforated with small holes for the purpose of distributing the vapour in minute streams, instead of permitting it to rush up in a large volume. The patentee says that his mode of construction is superior to "all others, as it saves fuel and labour, and produces more liquor from the same quantity of grain than any other mode of distilling yet known." He claims "the invention of placing the doubling still immediately over the singling still, and of the separating of the vapour in such a manner as to prevent the liquor that is to be distilled from being thrown apart, or from boiling in large vollies."

---

40. For a surgical *Apparatus for Drawing the Breast,* whenever it becomes necessary to do so, without the suction of the child; Elihu Blake, New York City, April 24.

"My invention consists,

"In having the suction performed by a self-operating elastic bag or bottle of India rubber."

"In devising the means of applying that power to the best advantage, and

"In having a *regulator* to adapt the instrument to any variation in the size or condition of the nipple."

The general description of this instrument is as follows. There is a nipple glass, with a bulb in the ordinary form, excepting that the part to which the mouth is usually applied is omitted, the glass being shortened, and terminating in a neck suitable for tying into that of an elastic bottle. The *regulator* is thus formed, a piece of wire terminates in a button at one end; the wire, forming the shank, is tapped, and has a nut on it to regulate its length. This regulator is of such size as to fit into the mouth of the glass, and is adjustable by the screw, by which the button may be made to stand so near to the end as to prevent the nipple from being drawn too far into the glass. The button is covered with a piece of sponge.

When used, the elastic bag is to be flattened between the hands, and the glass applied; the bag, by its expansion, will then produce the desired effect.

The quotation above made, constitutes the claim, there being no other in the body of the specification; a portion of this claim cannot, we apprehend, be sustained. We have, many years since, applied the India rubber bottle to the nipple glass, in the way, and for the purposes above described, and although it is not recollected where its use was learned, we are convinced that we may not set up any claim to the invention. Our present impression is, that glasses so attached, were known to us as long since as the days of our boyhood.

The regulator we believe to be new, and think it a very good contrivance; much distress is sometimes produced by the ordinary glass, from the effect which the regulator is designed to prevent. Had this been the only claim, we should have esteemed it valid, but joined as it is with others which are doubtful, it partakes of their insecurity.

---

41. For a *Lamp for Burning Lard;* Stephen P. Morehead, Ludlowville, Tompkins county, New York, April 26.

The following is the specification.

"This lamp differs in nothing from the ordinary tin japanned lamp, than there being placed a copper (or some metal containing copper,) wire in the top of it, and near to the tubes containing the wicks, and around which wire the flame plays. This wire being of copper, or of some metal containing copper, is a good conductor of heat, and reaches far down into the body of the lamp. The tubes for the wicks are also of copper, or of some metal containing copper. This lamp is constructed for the purpose of burning lard, instead of oil; the lard being much cheaper, and producing a more agreeable light. The wire and the tubes keep the lard in a liquid state.

STEPHEN P. MOREHEAD.

The foregoing constitutes the specification, and it will be observed

that there is no claim made, the whole being considered as new. The task is not an agreeable one, to inform a person who believes that he has drawn a prize, that a small mistake has been made in his number; we however, have become habituated to this task, and we now again have it to perform. On turning to page 412, vol. iv. of our first series, there will be found a drawing and description of a lamp for burning tallow, and other kinds of concrete fat. This lamp is in the form of the Argand's lamp, and was patented by lord Cochrane. More than twenty years before this we were familiar with the plan and arrangement now proposed. Lamps of this kind were made in Philadelphia with wires and tubes of copper descending precisely as in the present instance, and we believe that the plan was then patented; it, however, is unnecessary to ascertain this fact, as whether patented or not, the lamp equally lacks the essential feature, novelty.

---

42. For an improvement called the "*Concealed Percussion Gun Lock;* Joel Newbury, Poughkeepsie, Dutchess county, New York, April 27.

(Specification in the next number.)

---

43. For a machine for *Glueing Veneers on Columns or Pillars,* to be used in cabinet work; Benjamin Hinkley, Fayette, Kennebeck county, Maine, April 27.

The column which is to be veneered, is to be fixed in a frame, where it is held by screws, but so loosely that it may be turned round, by a cross bar, or crank, affixed to one of its ends. A waxed cloth, somewhat longer and wider than the veneer to be laid, is held in a vertical position, its lower edge being glued into a groove made along the column, and its upper edge fastened to a strip of wood. It is strained tight, by a rope passing from this strip, over a pulley, and acted on by a lever and weight. The veneer is placed against this cloth, its edge resting on the column, glue is then applied, and the column turned, the glueing being continued until the whole is wrapped round. The cloth is so managed as to strain tightly, and close the veneer to the column; it is then left until the glue is sufficiently hardened to take it from the machine, when the cloth is cut off, leaving a strip of it in the groove.

The description of this machine is elaborate, but not clear, the drawing which accompanies it is sufficiently well executed, but is without written references.

---

44. For a *Churn;* Abner Bristol, Hillsdale, Columbia county, New York, April 28.

A crank turns a shaft carrying a cog wheel, which takes into a pinion on a second shaft, on which there is also a fly wheel; a crank on this fly wheel gives motion to a lever, attached at the other end to the dasher of a common churn. This, we are told, is to save labour. For one of its relatives, see No. 15; the family is very large.

45. For a *Machine for Shaping Hammers, Spike Gimlets, and Pod Augers;* Ezra L'Hommedieu, Saybrook, Middlesex county, Connecticut, April 28.

This machine consists of steel rollers mounted in the manner of flatting mill rollers; their surfaces are to be so cut as to form dies for giving the proper shape to the hammers, gimlets, or augers. The claim is to "the application of the above described machine, to shaping the articles aforesaid, as my *discovery.*"

It had been previously *discovered* that nails, screws, spoons, forks, &c. &c. &c. might be formed in the above way. We very much doubt the possibility of sustaining a patent for every individual article which may be made by a well known method, as we cannot in such a case perceive either *invention* or *discovery.* If I want a piece of iron forged into a particular form, and the smith executes it with his hammer, anvil, and tongs, can I claim a patent for these as applied to forging iron into that form?

Among the various machines similar to this, is that of Mr. Davis, noticed vol. v. p. 159, for making nails, bolts, screws, &c. by rollers.

---

46. For a machine for *Cutting Scale Boards, Shingles,* and other articles; Josiah Fairfield, Vassálborough, Kennebeck county, Maine, April 28.

This machine is so much like some others which have been patented, for the same purpose, and which have been long in use, that there is but little doubt of its answering well. This circumstance, it is true, may interfere with its novelty, but not with its utility.

A horizontal wheel is turned by a vertical shaft; cutters, like spoke-shave irons, are placed on the upper side of this wheel, and the block to be cut is held on this side by any suitable contrivance. Nothing claimed.

---

47. For a machine for *Sizing and Napping Hats;* George Henning, Ithaca, Tompkins county, New York, April 28.

Without the drawings, the structure of this machine cannot be very well described, but the following may serve to give a general idea of it. A box is made which is to contain the hats to be sized, or napped. Within this box there is a sheeting, or net work, formed of links of copper, and covered with cloth, upon which the hats are placed. This sheeting can be raised and lowered by means of a lever and pulleys. Pieces, called paddles, and projecting pins, are fixed inside of the box, so that when the sheeting is drawn up by means of the lever, a strong pressure may be made upon the hats. The box, when used, is to be placed over a boiler, or kettle, of boiling water.

The claim is to "the whole of the above described machine, when applied for *sizing* or *planking* hats; and the bed of copper sheeting, or chains, with paddles and pins, when applied in *napping* hats."

We are informed that the above machine is highly approved, and bids fair to be extensively used, as it operates well and saves much labour.

By turning to the last volume, page 31, it will be seen that Mr. D. Baldwin, of Ithaca, New York, obtained a patent for a machine perfectly similar in principle, dated in October last. The likeness is so strong, that one is certainly the parent of the other.

---

48. For an improvement in the *Art of Making Glue;* Peter Cooper, City of New York, April 29.

(Specification in the next number.)

---

49. For an improvement in the *Mode of Mortising*, as in window sashes, doors, cabinet furniture, and the like; Abner Foster, Machinist, Phillipston, Worcester county, Massachusetts, April 29.

The above named machine is very clearly described, and very perfectly represented in the drawing; in its general structure it resembles a machine patented by Mr. John M'Clintic, Chambersburg, Pennsylvania, October 8th, 1827. In that machine, the chisels were brought down, and raised, by means of a lever moved by hand; in the present, two treadles are employed, one operating on a chisel to the right, and the other on a chisel to the left, to finish each end of the mortise; the chisels are elevated by means of spring poles. The only parts claimed are "the springs, and the treadles, and their application to the purposes of mortising."

Specifications of American Patents.

Specification of a patent for an improved mode of taking the Figures of Ingrain Carpets from the Cloth. Granted to William Sherwood, *Somersworth, Strafford county, New Hampshire, April 20th,* 1830.

This improvement will best appear by comparing it with the old methods. *First.* Figures have been taken from the cloth by the tedious operation of counting the threads. *Second.* They have been taken by copying the figure upon design paper, and then placing the paper against a reed, the splits of which correspond with the design, a simple having been previously drawn through each split. The figure is then picked up by the simples, where the paper is painted. In my improvement no reed is used, but a loop is made in the end of each simple, and the cloth being wound upon a roller, or beam, the filling is taken out of the centre of the figure. The changes of warp which make the ground of the carpet, are drawn through the loops, and wound upon another beam, which brings the cloth in a horizontal position, and the threads of warp which make the figure, are cut off close to the cloth. A wire is then run into the place of the centre thread of filling, which makes the figure, and when shoved back against the simples it separates the two parts required. The centre lash, or change of the filling, is then drawn out, and the next

lash is taken in the same way, and so on, until the figure is completed.

Instead of drawing the threads of warp, which make the ground, through the simples, as above described, those threads which make the figure, may be taken for that purpose; in which case the changes must be made by the filling of which the ground is composed, or a wire put in its place.

What I claim as my specific invention, is the connecting the threads to the simple. William Sherwood.

Specification of a patent for a process or method of purifying, tempering, and preparing the Juice of Cane, cultivated and grown in the United States, and rendering it better fit to be converted into Sugar than has hitherto been done. Granted to Augustus Archbald, *Sugar Refiner, of the City of New York, April* 19, 1830.

This discovery, application, or invention, consists, *first*, in neutralizing the juice, that is to say, rendering it perfectly free from acidity, without allowing lime, or any other alkali, that may be used, to predominate. *Secondly*, in precipitating the impurities, and thereby admitting of its being converted into sugar, with little or no skimming. *Thirdly*, in imparting to the juice the colour, or hue, that may be desirable for brown sugar.

For carrying into effect this my said improvement, I do operate as follows, that is to say, I do collect in one or more wooden, or other vessels, the juice running from the mill; the aforesaid vessel, or vessels, being arranged, and fitted in the interior with a copper pipe, circulating round the bottom, which may or may not be perforated with holes, as may be deemed most convenient, and so fitted with cocks, and connected with the steam generator, as to allow of the steam being let on and turned off at pleasure; the mode of arranging which pipe, will be understood by any engineer, or coppersmith. The receivers being sufficiently full, I do proceed to purify the juice, and prepare it for being converted into sugar in the manner following. I do mix well with the juice a certain portion of the mixture composed of lime and alum, called *finings*. I do apply the aforesaid mixture in the proportion of two pounds, or thereabouts, to every hundred gallons of juice, the mixture being well stirred with the juice. I do throw in, and stir well with the juice, small portions of good well slacked lime, made perfectly fine before applying it, or any other alkali, (preferring lime, as being most economical) and I do continue to add the same, until the test paper, or any other test that may be used to show the presence of acid, no longer changes colour. I do then examine the juice with the test paper, or other test showing the presence of lime, to ascertain whether I have given an excess of lime, or other alkali, in which case I do let in more fresh juice, in order to neutralize the excess of lime. Having by this first operation ascertained exactly the

quantity of lime requisite to temper or neutralize a given quantity of juice, in all subsequent operations, I do throw in at once the full proportion of lime, and mix it well with the juice, before heating it. The juice being thus perfectly freed from acidity, I do turn on the steam, and heat it nearly to the boiling point, or make it so hot that the hand cannot be dipped into it without the danger of scalding. I do then stop the steam, and immediately throw into the juice, and mix well with it, a further portion of the aforesaid mixture, made thin with water, which portion will be determined by observing in a tumbler, or other glass vessel, the rapidity with which the impurities of the juice precipitate; a sufficiency being applied, the juice is allowed to remain till the impurities settle, when the clear liquor is drawn into the evaporators, to be converted into sirop, or sugar, and the residue, or sediment, into another receiver, where it is mixed with a small quantity of hot water, and a small portion of lime, and allowed to settle, when the clear part is drawn off, and converted into sugar with the rest of the juice. Should it be desirable to impart a lighter colour to the aforesaid juice, I do increase the proportion of the aforesaid mixture, after stopping the steam, to allow the juice to settle as aforesaid, and I do declare that it is not indispensable to use the aforesaid finings, as the cane juice can be purified, though but very partially, with lime, or any other alkali alone, but the sugar therefrom has a tendency to turn gray, a colour always fatal to it in the grocer's market; besides, the impurities precipitate with difficulty, and the juice is dark.

I have discovered that finings applied to the cane juice as aforesaid, purifies the juice much more perfectly, hastens very considerably the precipitation of the impurities, and imparts to it, which is communicated to the sugar, that beautiful straw orange colour so much admired and desired in brown sugar; and, what is of no less importance, renders the molasses drained from the sugar made from juice that had been treated with it, much more pure and fit to be converted into sugar than it would otherwise be. It has been ascertained that by purifying the cane juice, and precipitating the impurities by the method aforesaid, a very large increase of sugar can be obtained, from a given quantity of cane, beyond what can be extracted when treated by the ordinary process of tempering and skimming.

The difference between my method of treating and preparing cane juice, and that generally used, consists in my precipitating the impurities thereof, whereas the impurities of the juice have hitherto been got rid of, and that very imperfectly, by skimming. My mode of tempering differs also materially from that usually followed. By my method the exact quantity of lime required by the juice, to correct the acidity therein contained, is applied with ease and precision, and the most ordinary negro, or even a boy, may in a few hours be taught to temper with the greatest correctness; whereas by the method of tempering generally pursued, it requires years of experience, and the most intelligent person; and even then it cannot be done with any kind of certainty, as sometimes too much lime is

given, which makes the sugar dark, and at others too little, in which case it granulates badly, consequently a large quantity of molasses is produced, and it drains with great difficulty. And with regard to the aforesaid mixture of lime and alum, or saturation of lime and alum, called finings, although I do not claim to have invented that compound, it having been long known; having discovered the important and valuable effects produced by it upon cane juice, I do mean to apply for letters patent to entitle me to the exclusive right to the application of the same to cane juice, for the purposes for which I employ it.

I will now proceed to state the method of preparing the aforesaid mixture called finings, which is as follows: a quantity of alum is melted either in a wooden or copper vessel, with its own weight of water, or thereabouts. A quantity of good well slacked lime, mixed with water sufficiently thin to allow the gross particles, or the lime that has not dissolved, to subside, leaving a kind of milk of lime, or very strong lime and water; this lime is then added to the alum, till the test paper showing acidity, changes colour no longer.

The test paper showing the presence of lime is then tried, to ascertain that lime does not predominate, the mixture being made perfectly neuter is then thrown upon a strainer, and allowed to drain off the water, when it is fit for use.

My invention, or improvement, upon which I claim in these my letters patent, an exclusive privilege, consists in this, my process, or method, herein specified, of purifying and preparing the juice of the cane grown or cultivated in the United States, intended to be converted into sirop, or sugar. W. A. Archbald.

Specification of a patent for an improvement in the making or manufacturing of Raw or Brown Sugar, from the Cane Juice, or from the sirop made therefrom. Granted to Wm. A. Archbald, *Sugar Refiner, of the City of New York, April* 19, 1830.

This improvement consists in concentrating, or converting the said cane juice into sirop, or sugar, in wooden vessels; which wooden vessels may be made of any convenient shape or size; in preference made of well seasoned white pine, fitted up and arranged in the interior with a copper pipe of a dimension suited to the size of the vessel which may be deemed convenient for the operation; or with a copper or other metallic vessel in the form of a globe, or in any other form calculated to receive and retain steam, and impart the heat thereof to the juice, or liquid, by which it is enveloped. But I do use in preference wooden vessels in the form of tubs, or tanks, of a round shape, hooped with iron, fitted in the interior with one or more rows of copper pipe placed horizontally, either lying close together, or at a small distance from each other, which pipe I do bend in a circular form so as to occupy and fill up the whole of the interior surface of the bottom of the tub, except a small space in the

centre, in which space I do fix a valve with a rod attached thereto, for the purpose of drawing off, or allowing the liquid to escape. This pipe is connected with the steam generator, and fitted with cocks to allow the steam being let on to boil the juice or liquid, and stopt at pleasure; which any engineer, or coppersmith, can arrange.

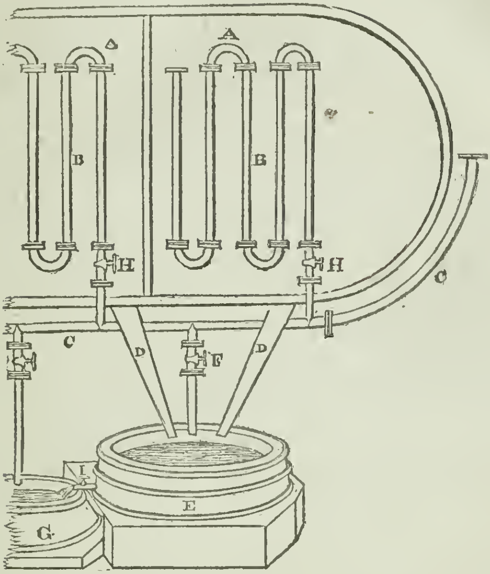
Now for the purpose of boiling or concentrating the cane juice into sirop, or sugar, I do use three or more of these wooden vessels, or tubs, placed one above the other, on wooden frames, so as to admit of the liquid being conveniently and freely drawn by a cock, or valve, into the lower one, which I do use as a concentrator, the others operating as evaporators. And I do by preference arrange the pipes of the aforesaid concentrator, so that both rows are close together, lying upon the bottom of the tub; while those of the evaporators are raised six or eight inches above the lower one, in order more equally to distribute the heat of the steam in the liquid; the lower end of this pipe I do pass through the bottom or side of the tub, so fixed as to prevent leakage at the hole through which it passes, at the outer end of which pipe, in each tub, I do fix a cock to allow the condensed steam to escape; and I do declare that in order to boil with economy and advantage, I do make use of the same steam that is employed to work the engine, that is to say, I do use steam generated by the same fire that is employed to produce steam for the engine, although steam generated in any way would answer. The aforesaid tubs may be arranged and placed in any way most convenient for operating; and the steam should be of a high temperature, such as is produced from steam of 40 or 50 lbs. to the inch, or upwards; the higher the temperature the more rapid the operation, and the better the effect upon the sugar.

In order to supply the tubs with juice, I do conduct it from the receiver by means of a wooden or other spout; the juice being converted into sugar, is drawn off into a cooler, and then transferred to moulds or hogsheads.

I now proceed to state the advantages to be derived from boiling the cane juice in wooden vessels, instead of, as is now done, in those of metal; and these advantages are, *first*, the cheapness with which they can be made, and the ease and economy with which they can be arranged and set. *Secondly*, their great superiority over metallic vessels in retaining heat, causing a considerable saving of fuel, and the rapidity of boiling resulting from wood being a nonconductor of heat, consequently not allowing any portion of the heat imparted to the liquid from the steam to escape, but confining the whole of such heat to the liquid. *Thirdly*, the absolute impossibility of burning the sugar, which by the ordinary mode of boiling almost invariably occurs, from the heat of the vessel. *Fourthly*, their seldom or never wanting to be renewed, and hardly ever needing to be cleaned, whereas the vessels now used, not only require to be frequently cleaned, at great trouble and loss of time, but often crack, or break, by which the planter is retarded in his operations, and suffers great loss.

I claim under these my letters patent, an exclusive privilege in

my improvement, which consists in boiling cane juice into sirop, or sugar, in wooden vessels. WM. A. ARCHBALD.



DESCRIPTION OF THE APPARATUS REFERRED TO IN THE FOREGOING SPECIFICATION.

A, A, receivers for the juice from the mill, serving as clarifyers.
B, B, copper pipe for heating the juice.
C, general steam conductor, leading from the steam boiler.
D, D, spouts to lead the juice from the clarifyer to the evaporators.
E, evaporator.
F, cock connected with the worm in one of the evaporators.
G, concentrator.
H, H, cocks connected with the pipe of the clarifyers.
I, cock to draw the juice from the evaporator to the concentrator.
The evaporators may be multiplied to any convenient number.

Note. The pipe in the clarifyers may be perforated with small holes, but it would be preferable to lead the condensed water off by a cock, instead of perforating the pipe.

Abstract of a specification of a patent for an improvement in the making or manufacturing of what is usually termed Raw Brown Sugar, from the juice of the cane grown or cultivated in the United States. Granted to WM. A. ARCHBALD, *Sugar Refiner, City of New York, April* 19, 1830.

THE improvement in the manufacture of sugar, consists in a mode of cleansing it of its molasses, after granulation, and imparting to it

a colour desirable for brown sugar, which is to be effected in the following way.

The sugar being sufficiently boiled, and cooled to the proper degree of temperature, is transferred into moulds, instead of into hogsheads, each mould containing from eighty to a hundred pounds. After it has become sufficiently hard, the moulds are taken into a room of a suitable temperature, generally a little above summer heat, the stoppers are then withdrawn, the sugar pierced, and placed to drain; at the expiration of about twenty-four hours, the cleansing process is commenced, in the following manner; the crust of the sugar is broken, and all the hard part, known by the name of *foot*, dug out; a certain quantity of cane juice, previously boiled to a proper density, and allowed to become perfectly cold, is then poured upon each mould, about a gallon is usually employed; this operation is three times repeated, at intervals of about twenty-four hours. The density given to the sirop is about thirty-two degrees of the *pese sirop*, of Beaumé; great precision is not required in this particular, and it should vary according as the sugar may have been high or low boiled. If at the expiration of twelve hours the sirop has not descended into the sugar, the surface should be again broken, and the loose sugar stirred up with the sirop; a small quantity of milk-warm water may also be added, mixing and combining it well with the sirop; the sugar also should be again pierced. At the end of three or four days after the last application of the sirop, one or two of the moulds should be emptied, to ascertain whether the sugar is sufficiently cleansed; if not, the operation must be again repeated upon all the sugar of the same day's boiling. It is then to be left to dry in the moulds until fit for the market.

The sirop which has been employed as above, may afterwards be converted into sugar, either by mixing it with the cane juice, or with the molasses drained from the sugar upon which it has operated, and then converting the mixture into sugar, or it may be converted into sugar alone, as may be found most convenient. In either case it may, in its turn, be subjected to the cleansing process.

The difference in this process as above described, and such as have been formerly used, is thus stated. The process which the patentee has applied to raw sugar, has hitherto been confined to refined sugar. The refiners invariably employ granulated, and generally white sugar to compose the sirop, which they clarify by the use of expensive materials, and at considerable labour. Great loss is consequent upon the employment of sugar in this way, sometimes to the amount of fifty per cent., as it is diminished in quantity and deteriorated in quality. In the present process, instead of expensive granulated sugar, simple sirop, which has never been made into sugar, is used, and suffers no diminution, or deterioration. There is a marked difference, therefore, in the two processes, first in the employment of sirop which is only in progress towards the formation of sugar, instead of sugar actually formed; and also in its application to brown, instead of to refined sugar. This consequently is deemed a new application of the process, producing new and valuable results.

The negroes in some of the colonies have been in the practice of pouring what they term *liquor*, upon the sugar in hogsheads, but it is notoriously a bad practice, injuring the article, and causing it to be rejected by the grocer. This liquor is, generally, a thin hot sirop, often poured on in a boiling state, which melts the grain of the sugar, descends but a few inches below the surface, concretes, and forms a dark, solid mass, producing great loss, and should it even drain through, it mixes with the molasses, and is sold as such. The present process varies materially from the foregoing, and depends for its success upon this circumstance; a thick sirop, in a cold state, is applied to the sugar in moulds, it being impossible to operate to the same advantage in hogsheads.

"My improvement consists in cleansing, or improving, what is generally termed raw brown sugar, made from the juice of the cane cultivated in the United States, by employing for that purpose cold sirop, made from cane juice, of a density suited to the sugar to which it is applied."

The first specification in this series explains the method of purifying and preparing the cane juice; and the second relates to the wooden vessels, &c. employed for concentrating it.

Remarks by the Editor.—The last of the three preceding specifications we have condensed into less than half the compass which it originally occupied, and as we have done this without omitting any thing necessary to a full exposition of the views of the patentee, we apprehend that our readers will not complain.

The culture of the cane, and the manufacture of sugar, have become objects of great national importance, and are rapidly extending. The cane has been planted as far north as South Carolina, and that with considerable success. The whole business, however, is a new one in the United States, and we have determined, therefore, to publish such information upon the subject as may appear to us likely to do good; and particularly those processes for which patents have been obtained either at home or abroad. In carrying this intention into effect, we shall be careful not to devote an undue portion of our Journal to this particular inquiry, to the exclusion of that variety which is an essential feature of such a work.

In our selection of English patents, we are frequently governed by their similarity to such as are obtained here, although we have rarely thought it adviseable, or necessary, to particularize the instances, but have left them to speak for themselves.

Specification of a patent for manufacturing from Wool, without the process of spinning and weaving, Pantaloons, Stockings, Drawers, Wrappers, Petticoats, Vest Bodies, &c. Granted to Jesse Foster *and* James Stoutenburgh, *Green county, New York, April* 20, 1830.

Specification of the method of making the various articles above mentioned.

1st. A carding machine without the roller, and the doffer covered with cards so as to bring the wool from the machine in a continued web.

2nd. The web is thrown on an apron of leather, or other material, which revolves round a platform, or table, with rollers to each end.

3d. From this apron the web is wound upon a pattern of the articles to be constructed, diagonally, so as to cross the wool in every direction, until a proper thickness of the web is obtained, and is then taken from the pattern, and hardened, either by steam, or heat, and is then fulled or planked, to a suitable consistence, and dressed and finished, with or without colouring.

4th. Patterns of the articles may be made of wood, and suitably adapted to each garment. Pantaloons are made in two entire legs and upper parts, requiring a single seam to connect them and form the article. Stockings, petticoats, are made entire, and other articles according to pattern.

Jesse Foster.
James Stoutenburgh.

Remarks by the Editor.—The foregoing specification seems to proceed upon the idea that the thing proposed to be done is perfectly new in every particular, yet there is not any thing in it different from the mode in which hat bodies have been set up. There is, it is true, some difficulty in knowing what is intended to be patented, yet if we take the words of the specification itself, it is for the *method* of making the various articles mentioned; in this case there must be some novelty in the machinery, upon which to found a claim; there, however, is no drawing accompanying the description, which there must have been, had the patent been taken for any thing admitting of drawings. By the term method, therefore, we must not understand the employment of a machine. Is the method felting? this is not only old in itself, but the mode of laying the wool upon a piece serving as a pattern is so also. There remains, we think, nothing to claim but the making of the particular articles enumerated, by a method before known and used, in doing which there would not appear to be much either of *invention* or *discovery.*

Our readers are aware that some half dozen patents have been recently obtained for making cloth by felting; time enough has elapsed to have brought some of it into our markets, had the process been effectual; we are very apprehensive that the circumstances which caused similar attempts to fail both in France and England about forty years ago, and which have defeated many successive trials both in Europe and this country at various subsequent periods, will still render it necessary to twist the fibres of wool, and pass them through the loom, in order to the production of good cloth. So far as we know, all the fabrics which have been made in imitation of cloth, by felting, have been sleezy and weak, or thick and harsh.

Specification of a patent for a Self-operating Temple. Granted to Ephraim R. Otis, *Lyme, New London county, Connecticut, April* 2, 1830.

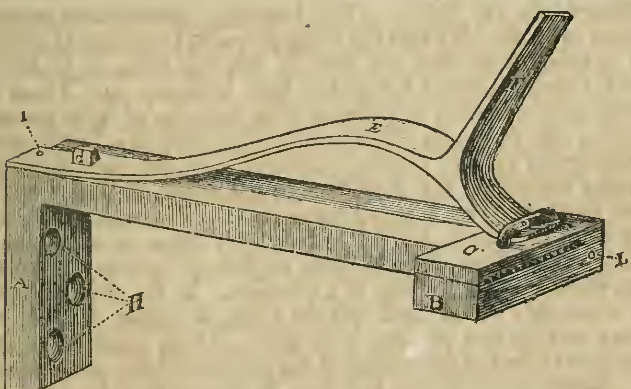
Be it known that I, Ephraim R. Otis, of Lyme, in the county of New London, and State of Connecticut, have invented a new and useful self-operating temple, and that the following is a full and exact description of the construction and operation of the said machine as invented by me.

A, in the drawing hereto annexed, represents the standing part of the temple, which is made of iron, and is attached to the breast beam of the loom (two temples to each loom.)

B, represents the lower or under jaw of the temple, which, together with the standing part, is of one piece of iron.

C, represents the upper jaw of the temple, which is grooved on the under side like a common float file, and is connected at one end, L, by a hinge; the cloth passes between the jaws.

D, represents a staple attached to the upper jaw under which the spring, E, plays.



E, represents a spring of steel, attached at one end to the standing post, by an iron pivot, or pin, marked I, and a screw marked G, and rests on the jaw C, and passes through the staple D.

F, represents a piece of iron about two inches long, connected with the spring E, by which the temple is made to open, shut, and grasp: the part F, being operated upon by an iron knob, or wood screw, placed in the top part of the lathe of the loom, projecting from $\frac{1}{4}$ to 1 inch, and striking against the projecting part F, of the spring E, which opens the jaw and permits the cloth to pass, and again closes.

G, represents a square screw, made to turn with a wrench, or driven, to tighten or loosen the spring, as may be required.

I, represents an iron pivot which attaches the spring to the standing part.

H, represents three holes in the standing part countersunk for screws to attach the standing part to the breast beam of the loom.

L, a screw passing through the hinge, which connects the upper jaw C, with the lower and immoveable part. E. R. OTIS.

Remarks by the Editor.—On the 19th March, 1827, a patent was obtained by Alfred Jenks and Jesse Clewell, of Holmsburg, near Philadelphia, for a spring temple, which in its general construction and operation bears so strong a resemblance to the one above described, as to lead to the conclusion that they are merely different forms of the same thing. In the specification of Jenks and Clewell, each temple is stated to consist of two plates, or pieces, fastened together by means of rivets, or of screws, and of a lever by means of which the jaws formed on one end of the plates may be separated from each other. The lower plate is to be fixed to the breast beam of the loom by means of screws, for which purpose it is perforated with holes, or rather with slots, by means of which it may readily be adjusted to its place.

"A pair of these temples are fastened to the breast beam, at such distance apart that the cloth may pass within their inner edges, whilst their lateral jaws will embrace the selvage." "From the lower part of the lay, adjusting screws project forward, so that at every beat they touch the levers, and open the jaws of the temples, which again close as the lay recedes."

Some difference in arrangement might be expected where two persons had conceived the same idea, whilst each had devised his own mode of carrying it into effect; *more* than this will not be found in the present case.

ENGLISH PATENTS.

To JOSHUA BATES, *Merchant, for a new process or method of Whitening Sugars.* Dated August 1, 1829.

IN describing the benefits to be derived from this invention, the patentee, to render them more clear, describes that part of the preparation of loaf sugars termed "claying," in which he states that the raw sugar after having undergone the operations of clarifying, boiling down, and graining, is poured whilst yet warm and in a liquid state into unglazed earthenware pots, of the form of an inverted cone, having an aperture at the taper end; this, however, is stopped up whilst the sugar remains liquid, and the latter is stirred up with a stick several times whilst being poured into the pots, in order to prevent its sticking to the sides, and consequently, to facilitate its expulsion when required. The sugar when cool is no longer fluid, but an aggregate of crystallized grains, the spaces between them being filled up with a brown sirop, which, owing to the porosity and consequent capillary attraction of the former, would never drip out unless by the action of water. To expel this sirop, therefore, the process of claying is resorted to, which is effected by mixing up a

quantity of pipe-clay to the consistency of batter, and placing it on the surface of the sugar about one inch in thickness; the consequence of this is, that the water, extricating itself by degrees from the clay, filters gradually through the sugar, and finally through the aperture in the pot, carrying away the sirop which mixes with it on its passage. This operation is again repeated, and sometimes a third time, the clay being removed and a fresh mixture applied on each occasion; the sides of the pot being gently tapped, the loaf comes out, and is found whitened, with the exception of the point, which frequently retains a rather inferior colour.

To this, which is the ordinary mode of operation, there are several objections, which the patentee states his invention will obviate. The quality of the sugar is impaired by the irregularity with which the water passes through it, as the liquid must necessarily percolate more quickly when the batter is first placed on, than towards the end of the different operations, when the clay becomes nearly dry. This latter after its first use is again mixed up for future occasions, and, as appears by the patentee's statement, it imbibes a portion of the sugar, from its continual contact with it, and when exposed to the heat of a sugar house, frequently becomes sour and imparts a bad flavour to the sugar to which it is next applied.

To remedy these defects, he constructs a small circular vessel or saucer, of unglazed earthenware, of that description of which wine coolers are generally manufactured, which is made so as to fit into the larger end of the sugar pots, with an interval of about half an inch round its sides. This being placed on the sugar, in the same situation where the clay batter is usually employed, is filled with water, which, percolating through it gradually and in a minute state of division, may be caused to continue filtering through the sugar with unvaried regularity, until the whole loaf, including also the point, be entirely divested of sirop. Mr. Bates does not confine himself to the substance mentioned for forming the filters, but states, that they may be constructed either of hair sieves, in which a quantity of sand has been placed, of filtering stones, or of any material through which liquids will pass gradually and minutely divided.

The above is the nature of the improvements as relating to the whitening of loaf sugars; the patentee in continuation observes, that in the whitening of raw or muscovado sugars by the process of claying, it is found impossible from the partial adhesion of the grains to each other, to cause by pressure an equal distribution of the water. To remedy this defect and the consequences arising from it, he employs a large circular pan, the bottom of which is fitted with an indefinite number of pots, of the same form as those employed for the loaves, and like them furnished with an aperture; into these the raw sugars are pressed, and a vessel similar to the first described filter, only varying in size, is placed over the pan and filled with water. This plan, he observes, has been found to whiten sugars more effectually than the ordinary method: and, as he claims as his invention, the employing a series of moulds, or inverted cones, for

the raw sugar, he states, that the process of claying may be also used in conjunction with them, in lieu of his filter, as described.

[*Repertory Pat. Inven.*

To MOSES POOLE, *Gentleman, for certain improvements in the apparatus for Raising and Generating Steam and currents of air, and for the application thereof to Locomotive Engines and other purposes. Communicated by a Foreigner.* Dated July 8, 1829.

THE first part of these improvements consists in the formation of the boiler of a steam engine; this is constructed of a series of tubes placed so as to form a sort of square cage work, surrounded by a casing of iron, into which the fuel is placed, and having an opening at the top for the chimney. The tubes are placed in a horizontal position, and each is screwed into an iron casting, being made steam tight by bringing over a nut at the opposite side, with a packing of asbestos or fire-lute interposed. The size of these tubes is to be regulated according to the power required; but those represented in the drawing of the specification are on a scale of three feet in length, with a bore of one inch: they are shown as attached to a locomotive carriage, to which the patentee states them to be eminently adapted.

The pipes communicate with one another throughout the whole series, and to the extremities of the first and last, or, for better explanation, to the two ends of the coil of pipes, are affixed two vessels or receptacles of steam, which Mr. Poole terms the "*separators;*" where any water which may be forced into them along with the steam, will separate itself by its own gravity, and will be then recirculated through the tubes by the force pump above mentioned. When it is required to clean them, this can be done by a rod furnished with a barb, similar to that employed in cleaning guns, being introduced into the pipes by withdrawing the nut; water is then forced through them by the pump, and all sediment being loosened is carried off.

The next improvement is the causing the steam to enter below the piston at the bottom of the cylinder, (which is placed horizontally) by which means, the patentee states, any water that may accidentally flow into it will be forced out; this he asserts would *not* be the case if caused to enter above the piston, as in ordinary engines. In adapting this engine to a locomotive carriage, rotary motion is imparted to the hinder wheels by means of cranks, and the parallel motion of the pistons is regulated by a wheel running on iron rods.

To generate the currents of air as expressed in the title, a tube is affixed to the waste pipe, from the former of which branch out three or more very small tubes; these are carried to the chimney, where it is stated they will be found of peculiar advantage, particularly in carriages where the flues are necessarily short; the effect they will produce being a continued draft through the fuel, arising from the steam in passing through the minute apertures of the small tubes, causing by its velocity a partial vacuum in the chimney, which can

only be filled up by air passing through the fuel, every other aperture being closed. There is also described, a method of stopping the carriage, or retarding its progress, by means of a lever attached to the perch, between the hinder wheels. This lever works like a hinge, in an iron sledge or drag, which is attached to a chain that extends under the whole length of the carriage, and passes round a small windlass, that is worked by a handle passing upwards to the seat of the driver. When it is required to stop the coach, the chain is wound round the windlass, and in thus pulling forward the drag and lever, the latter, being made somewhat longer than the radii of the wheels, lifts the hinder ones from the ground, which continue their rotary motion without propelling the carriage; the engine consequently continuing to work, the circulation of water through the boiler is not prevented. [*Ib.*

FRANKLIN INSTITUTE.

Monthly Meeting.

The stated monthly meeting of the Institute was held at their Hall on Thursday evening, May 27, 1830.

Professor A. D. Bache was appointed chairman.

The minutes of the last meeting were read and approved.

The following donations were presented to the Institute, viz.

Dobson's Encyclopedia, 18 *vols.* presented by Charles J. Ingersoll, Esq.

Scott's Life of Napoleon, 3 *vols.* presented by Mr. S. V. Merrick.

Register of Arts and Sciences, 1*st vol.* presented by Mr. W. H. Keating.

Speeches on the Jew Bill, in the House of Delegates of Maryland.

The American Biographical Dictionary.

Nugent's Dictionary of the French and English Languages.

A Catalogue of the Loganian Library, with an account of the Institution, presented by Mr. Edward G. Dorsey.

Description of the Jackson Bridge, with directions to the Builders of Wooden or Frame Bridges.

Notice d'Instruments, d'Optic, de Mathématique, et de Physique, presented by Isaac Hays, M. D.

A general collection of Maps, Charts, Views, &c.

A series of the Freeman's Journal, from 1*st of January to* 31*st December*, 1821, *bound.*

The American Museum, 4 *vols.*

The Analytic Magazine, 1 *vol.* presented by Mr. Robert Desilver.

Washington's Letters to Arthur Young.

Catechism on Education, presented by Mr. Adam Ramage.

Message from the Governor, accompanied with the report of the canal commissioners, read in the House of Representatives, (Pennsylvania) December 13, 1828.

The Report of the Board of Canal Commissioners to the Senate of Pennsylvania, December 18, 1829.

The Report of the Committee on Roads and Canals, to Congress, on the Chesapeake and Ohio Canal, January 2, 1828.

The Fifth and Sixth General Report of the President and Directors of the Chesapeake and Delaware Canal.

The Annual Report of the President and Managers of the Union Canal Company of Pennsylvania, November 20, 1827.

Letter and document in relation to the dissolution of the engagement of L. Baldwin with the Union Canal Company.

The proceedings of the Citizens of Baltimore respecting improving the intercourse between that city and the western states, presented by Mr. George Merrick.

The corresponding secretary laid on the table the following works, received in exchange for the Journal of the Institute, viz.

London Journal of Arts and Sciences, for April, 1830.

The Mechanics' Magazine, for March.

The Register of Arts and Journal of Patent Inventions, for April.

The Repertory of Patent Inventions, for April.

Gill's Technological and Microscopic Repository, for April.

The Quarterly Journal of Science, Literature and Arts, No. 13, new series.

The American Quarterly Review, for April.

Annales de Ciencias, Agricultura, Commercio y Artes, vols. 1st and 2nd.

The American Journal of Education, for May.

The committee appointed to fit up the library and reading room, reported that they have collected about $400 in voluntary subscriptions from the members, and were progressing in the object of their appointment.

The committee on inventions presented their report on William Woodworth's machine for planing, tongueing, and grooving boards, and also on Whiting's improved saw set, which were severally read and accepted.

The committee appointed to try the experiments on water wheels, reported that they were daily progressing in the duties assigned to them; they also communicated the following letter, addressed to their chairman, and received a few days since.

Boston, May 6, 1830.

Sir,—The laudable measures adopted by the Franklin Institute, for ascertaining "the value of water as a moving power, and the relative effects produced by it on water wheels of different constructions," having been made known to the directors of the New England Society for the Promotion of Manufactures and the Mechanic Arts, the undersigned were appointed a committee, to make inquiry, as to the expediency of affording aid in the prosecution of such experiments as may be necessary to establish the principles upon which that power may be calculated, and most advantageously applied.

From information derived from the various communications published in the Journal of the Franklin Institute on this subject, and that obtained by one of the committee, who has recently visited

Philadelphia, and examined the apparatus used in the experiments, we are happy to assure you of our entire confidence in the abilities of the gentlemen charged with this highly interesting and important inquiry, and of our satisfaction as to the manner in which it is prosecuted. The results cannot fail to be of great public utility, and to do honour to the institution which caused them to be attained. We, therefore, are authorized by the New England Society for the Promotion of Manufactures and the Mechanic Arts, to subscribe three hundred dollars to the fund required for conducting the experiments, which have been commenced under such favourable auspices, and enclose, most cheerfully, a draft for that amount.

With great respect, we have the honour to be

Your most obedient servants,

P. T. Jackson, } *Committee New England*
H. S. Dearborn, } *Society P. M. and M. A.*

Samuel V. Merrick, Esq. *Chair. Com. Experiments, &c. &c. &c. of the Franklin Institute.*

The subject of accidents occasioned by explosions of boilers in steam boats, was introduced by a member, which gave rise to a very animated and interesting discussion, in the course of which the different causes of these accidents were pointed out, and various means suggested for guarding against their consequences and occurrence.

Alexander Dallas Bache, *Chairman.*

Isaac B. Garrigues, *Recording Secretary.*

BOARD OF MANAGERS.

Proceedings relating to the Explosion of Steam Boilers.

At a meeting of the Board of Managers of the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts, held at their Hall on Thursday, the 13th of May, 1830, the following preamble and resolution were passed, viz:—

Whereas, the object for which the Franklin Institute was established, was the promotion of the success of the mechanic arts by all the means within their power, and whereas numerous accidents have occurred, of late, in steam boats, the effect of which is to impair the confidence of the public in the merits of an invention which has shed vast honour on the American name, and which has essentially contributed to the prosperity of this country: therefore be it

Resolved, That a committee of five members be appointed, whose duty it shall be to inquire and report whether it be expedient for the Board to institute an investigation into the probable causes of these accidents, and the proper remedy to be applied to prevent their recurrence.

Messrs. Wm. H. Keating, George Fox, Isaiah Lukens, M. W. Baldwin, and Samuel V. Merrick, were appointed on said committee.

At a subsequent meeting of the Board, held June 10*th*, 1830, *the above committee made the following*

REPORT:

The committee appointed by the Board of Managers of the Frank-

lin Institute, to "inquire whether it be expedient for this Board to institute an investigation into the probable causes of the accidents in steam boats, and the proper remedy to be applied to prevent their recurrence," respectfully report:—

That, after mature reflection, and consultation with many of the members of the Institute, they are decidedly of opinion that such an investigation, if undertaken in a proper manner, and carried on with perseverance, cannot fail to lead to interesting, or even important results. The application of steam to navigation has been attended with such unforeseen advantages to the world at large, and to our own country in particular, that no series of accidents in steam boats, however frequent in their recurrence, or fatal in their consequences, could probably deter the public from the use of them; but if the boats shall continue to run unrestrained by any regulations whatsoever, they must occasion a serious waste of property, and what is much more lamentable, a great destruction of life. These accidents ought not by any means to be considered as an unavoidable consequence of steam navigation. They proceed, it is believed, in most cases, from defective machinery, improper arrangement or disposition of the parts, or finally, from carelessness in its management. That the causes of accidents may be partially, if not wholly, removed by salutary regulations, appears highly probable; and that there must be a power in the community, lodged somewhere, to protect the people at large against any evil of serious and frequent recurrence, is self evident. But that such power is to be used with extreme caution, and only when the evil is great, and the remedy certain of success, seems to be equally indisputable.

To determine what regulations, if any, should be adopted, it is necessary first of all to ascertain the true causes of these accidents. This requires an attentive examination into the circumstances of each explosion, and is a task that will demand extensive correspondence and interchange of ideas. It should be undertaken with a single view to the benefit of the public, and to the complete perfection of an invention which has brought unparalleled honour upon the American character. It should be made apparent, to all such as may be called upon for their advice or opinion in the matter, that the investigation is founded upon the kindliest motives, and not accompanied by a willingness to fetter that branch of industry by any unnecessary regulations. With this view, it appears to your committee that the inquiry can best be carried on by a public body whose views are so well known and appreciated by the community, as to place their motives beyond suspicion. That the subject is one of the utmost importance, is evident from the fact that the congress of the United States have twice entertained the question, and that the parliament of Great Britain, as well as the government of France, have deemed it worthy of their peculiar care. Could the question meet with that thorough discussion and investigation before a committee of congress which its importance and difficulty require, we would forbear from recommending to the Institute to take any steps in it; but as it is well known that from the many subjects which press upon the at-

tention of congress, and from their indisposition to follow the British precedent of instituting inquiries founded upon the personal evidence of practical men, it becomes a difficult task for a committee of their body to possess themselves of a knowledge of the facts that have been developed, during an experience of twenty years, over so extensive a country as ours. It appears to us that such an investigation must first be undertaken by those who are most conversant with the subject, and who, as representing a large body of mechanics, are desirous of seeing the arts free and prosperous, and as forming themselves a part of the nation, are interested in the passage of all laws, the object of which is the protection of the lives and property of their fellow citizens;—that our society constitutes such a body, no one will doubt. To collect all the information they may be able to obtain on this subject, to digest this information, and to deduce from it such conclusions as it may naturally suggest, appears to us, therefore, to be a fair and legitimate exercise of the trust reposed in this Board; indeed, we are fully confirmed in this position, by the interesting discussion which was spontaneously elicited at one of the late meetings of the Institute, in which many members expressed their strong belief that the subject ought to be inquired into: and as it can best be done by eliciting the opinions of many who are not included in this Board, we would suggest the appointment of a large committee, taken from the members of the Institute, to whom the following questions shall be submitted:—

1st. What are the probable causes of the explosions of boilers used on board of steam boats?

2nd. If any, what are the best means to obviate the recurrence of these evils, or to diminish the extent of their injurious influence, if they cannot be wholly guarded against?

3d. By what means can these remedies be applied and enforced?

Whereupon, on motion, the above report was accepted, and a committee were appointed with instructions to prosecute the inquiries set forth in the foregoing report, and to report their results to this board.

Circular letter of the Committee appointed at the above named meeting of the Board of Managers, to inquire into the causes of the explosion of the Boilers of Steam Engines.

"The Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts," have had their attention lately called to the subject of the explosion of steam boilers, by the lamentable number of accidents that have occurred in steam boats during the present season; and by the painful circumstances which have in many cases attended these accidents. They have long had the subject before them, and are impressed with the hope, that those explosions were produced rather by imperfection in the construction, arrangement, or management of the machinery, than by any inherent and irremediable source of danger in the invention itself. Feeling a high interest in the promotion of the success of the mechanic arts,

and especially of that of steam navigation, which with pride they consider as peculiarly the offspring of American ingenuity and perseverance, they have appointed the undersigned a committee for the purpose of inquiring,

1st. What are the probable causes of the explosions of boilers on board of steam boats?

2nd. If any, what are the best means to obviate the recurrence of these evils, or to diminish the extent of their injurious influence, if they cannot be wholly guarded against?

3d. By what means can those remedies be applied and enforced?

We are aware, that no investigation of so difficult and extensive a subject, can be productive of good, unless it occasion a concentration upon one point, of all the information that results from the use of steam boats over so vast a country as ours, during a period of upwards of twenty years. With this view, we beg leave to call your attention specially to it, and to request that you may be pleased to communicate to us the result of your observation, experience or reflection, on these interesting questions. We shall feel thankful to you, particularly for an account of any explosion, which may have occurred in your vicinity, or under your observation, or of which you may have obtained correct information. By collecting the *facts* in a number of cases, we may be able to arrive at some satisfactory conclusions, as to the causes which produced them; we are aware, that these may have been different, in different cases, and although we are by no means prepared to assume it as certain, that a simple and efficacious remedy will be devised, yet we hope that such a one may be found, and one which will not unduly interfere with the rights of individuals, or with the freedom of commerce and industry.

We had at first proposed to draw up a series of questions for publication and circulation, but upon mature deliberation prefer to leave the subject open, assuring you, that any information or suggestion will be thankfully received, and duly acknowledged in the report which we shall make of the result of our investigation. We beg leave, however, to suggest a few general heads, which may direct your attention to those points upon which we are chiefly anxious to obtain information, viz.

The Boiler.—Its size, form and relative thickness, the material from which it is made, (of copper or iron, &c.) if of iron, whether of foreign or American iron, especially in the boilers that exploded.

Safety Valve.—Its form, size, load in proportion to the thickness of the boiler, liability to get out of order, facility of repair, number used, location.

Supply of Water.—Mode of insuring a sufficiency, how gauged?

Arrangement of the Boilers in the Boat; which is the least liable to accident?

Construction of the Boat—to avoid the accidents in the boilers.

In addition to these, we will add, that our wish is that the investigation should take the widest range, and we beg that you will give the same scope to your answer.

Please direct your reply to Mr. William Hamilton, Actuary of the Franklin Institute.

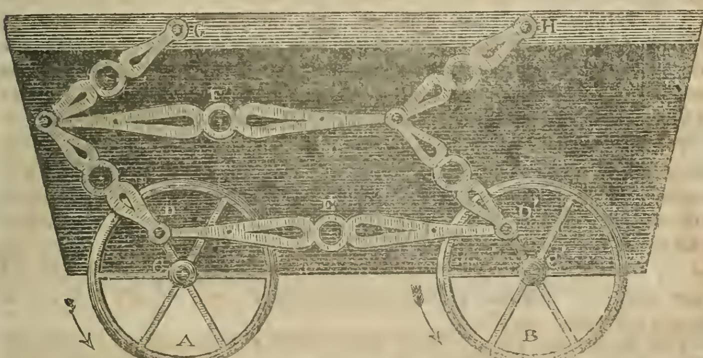
W. H. KEATING,
ROBERT HARE, M. D.
SAMUEL V. MERRICK,
ALEXANDER DALLAS BACHE,
ISAIAH LUKENS,
JAMES J. RUSH,
JAMES RONALDSON,
FREDERICK GRAFF,
R. M. PATTERSON, M. D.
J. K. MITCHELL, M. D.
BENJAMIN REEVES,
GEORGE FOX,
THOMAS P. JONES, M. D.
WALTER R. JOHNSON,
M. W. BALDWIN,
JAMES P. ESPY,
GEORGE MERRICK.

New method of communicating Circular Motion in a lateral direction. *By* WM. HOWARD, Esq. United States Civil Engineer.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

SIR,—So far as I am informed, the arrangement which I describe below, is new. It is possible, however, that your extensive knowledge of machinery, may include it in your list of "Modern Antiques," as having been thought of long ago: but if not, I would be obliged to you to insert this paper in the Journal.

WM. HOWARD.



A and B, are two wheels intended to have a similar circular motion, round their centres C and C′, E, F, G, H is a system of parallel rules, attached to the pins or cranks D and D′, and also fastened to the points G and H, which points are immoveable with regard to the centres C and C′. From a little consideration of the above sketch, it appears that the line DD′ being always parallel to GH, and the distance of D and D′ apart being invariable on account of the connecting bar, one of these points must exactly describe the curve described by the other.

I have sent you a drawing of the manner in which I have applied this arrangement to a small model of a locomotive engine, for which it was contrived, and have found it to work very well. The imperfection of the toggled chain, formerly used in such engines, and in cot-

ton machinery, has, I believe, caused it to be generally laid aside. In some of the engines lately made in England, a connecting bar, similar to the above, has been used, but without the addition of the parallel rules.

MODERN ANTIQUES, No. 3. *By the Editor.*

Economical mode of Transmitting Motion. Invented by MR. JOHN M'DOWALL, *Vauxhall. From the Register of Patent Inventions, for October*, 1829.

"MOTION is often required to be communicated to machinery at a distance from the first mover, and this is usually effected by a metallic shaft, which, if the distance between the machinery and the first mover be great, must be made of considerable thickness to prevent its being twisted to pieces by the power applied, or else by chains, straps, or ropes, to prevent the slipping of which on the drums or pulleys over which they pass, causes considerable impediment to the motion, by friction. These are inconveniences which cannot in all cases be avoided; but, under some circumstances, the following method of transmitting motion, through the medium of three rods and two triple cranks, connecting the machinery with the first mover, might be introduced with considerable advantage.

"The apparatus is represented with the axes of motion placed horizontally by Fig. 1; and with the axes placed vertically by Fig. 2. The same letters represent similar parts in both figures. It will be perceived that the motion may be in the direction shown by the arrows, or the contrary; and hence the motion may be reversed at pleasure.

Fig. 1.

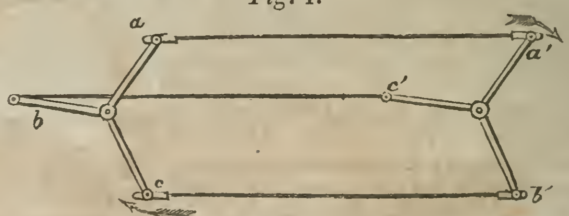
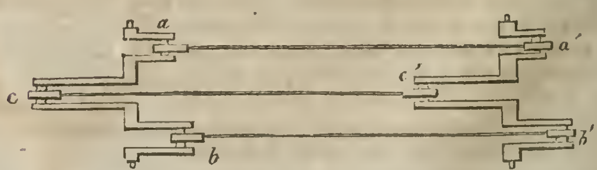


Fig. 2.



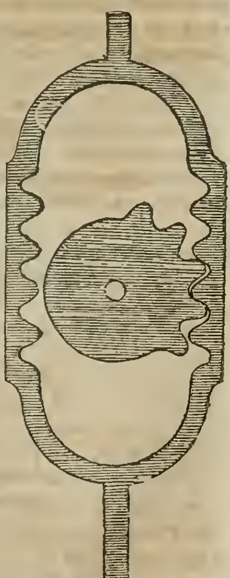
"The triple crank *a*, *b*, *c*, to be put in rotation by any first mover is connected by three rods to a similar crank, *a'*, *b'*, *c'*, of equal dimensions; and as the cranks project from the axes at equal dis-

tances, there will always be one of them in a position to produce a pulling action, and hence there will be no necessity for having the conducting rods stronger than merely to sustain by tension, the resistance of the machine to be put in motion; and thus the expense of transmitting motion, by this method, to a considerable distance, will be very small. The motion, too, will be perfectly uniform, for, as the leverage of the crank *a*, for instance, diminishes by its rotation, that of the corresponding crank *a'* will be equally diminished; so that whatever motion is produced by the first mover will be faithfully transferred to the machinery."

Perhaps we ought not to place the foregoing under the head of Modern Antiques, as our first acquaintance with it is of only thirty years standing; nor do we dispute the claim of Mr. M'Dowall to the title of inventor; we only know that either he must have invented it many years ago, or he was not the first inventor. The late ingenious and venerable Charles Wilson Peale, the founder of the Philadelphia Museum, devised and applied this apparatus to communicate motion from a turn-stile entrance upon the stairs of his museum, to a set of bells, which, in a distant part, gave notice of the approach of visiters. We have no doubt that Mr. J. J. Hawkins, engineer, London, has a perfect recollection of this contrivance, as it was in use previous to his return to England.

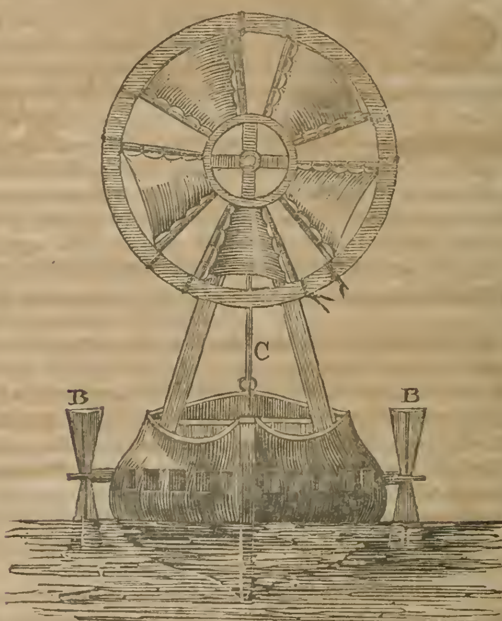
To communicate a vertical motion to a Piston, by means of a continued rotary motion of a crank. Proposed by M. Auger.

In the 4th volume of *Machines Approuvées*, page 19, under the date of 1721, we find the contrivance represented in the accompanying cut. Those familiar with machinery know that under various modifications it has been applied to the pistons of steam engines. In the present instance the motion was to be communicated from the section wheel to the piston, whilst in the steam engine this is reversed. There is in the French account a description and drawing of an appendage to the piston, not here represented, intended to secure the engaging of the teeth of the wheel into those of the racks as they change from one to the other. The patent office, and the domestic and foreign journals, are ready to give testimony that this invention merits a place in the society in which we have placed it. If its merits, however, are to be tested by its utility, neither its ancient or modern inventors have any great cause for boasting.



On the construction of a vessel moved by the force of wind, and propelled directly against it.

There are as many believers in this, as there are in perpetual motion. M. De Quet proposed it in the year 1714, and it has its place among the *Machines Approuvées*, whence we have taken the subjoined cut. The same thing was patented by Hull Chase, in August, 1828. How often it had been previously patented we have not inquired; we know, however, that models, drawings, and descriptions, have been presented at the patent office, and elsewhere, and more than one anxious wight has expressed his fears lest some one should rob him of the invention. M. De Quet says that the sails fixed in the way which he directs, will cause "the vessel to advance in a course directly contrary to that of the wind;" and Mr. Chase, 114 years afterwards, testified that he had actually verified the assertion, and patented the new discovery.

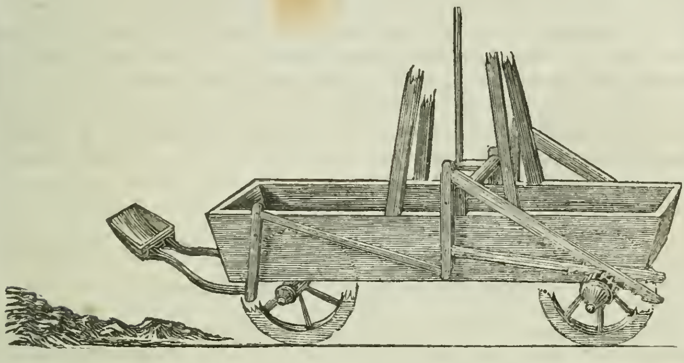


A is a circular hoop, or wheel, to which gib sails are attached, so as to revolve by the wind. The axis of the wheel turns the shaft C, which operates upon the revolving paddles B, B, which, if the wind can communicate a thousand times more force than it possesses, will cause the vessel to advance in the wind's eye.

A self-loading cart propelled by wind.

M. De Quet proposed also to apply the same kind of wind sails

to propel a cart, and cause it at the same time to load itself. We have not thought it necessary to show the sails, in the accompanying sketch, as they are seen in the last figure. The wheels of the vessel, and those of the cart, were to be driven by the same kind of machinery, the action of which may be seen on the hub of the hind wheel, which was to be acted upon by a kind of a rack and pinion motion, the hub, or nave, having teeth around it, and the two levers with corresponding teeth are alternately to be brought into operation.



FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Reply to the Query respecting the Sinking of an Iron Pot in the sea.

Sir,—In the Journal of the Institute for May, p. 327, is the following query.

"Suppose an iron pot be dropped into the sea, with its mouth downwards, and one cubic foot of inclosed air by its buoyancy prevents it from sinking; the addition of one pound of the same metal places the vessel in an equilibrio at the surface, but two pounds being added, it sinks."

"1st. If it descends in an upright position so as to prevent the escape of air, and it be not intercepted by the bottom of the sea, at what depth will it become stationary?"

"2nd. At its stationary depth will the removal of the extra two pounds weight cause the vessel to rise again to the surface?"

In answer to the first query, I say, the pot will not become stationary till it reaches the bottom, for as it descends, the air becomes more and more condensed, and of course the water rises higher and higher in the pot, and the specific gravity of the whole mass is increased; the pot will, therefore, descend with an accelerated velocity till it reaches the bottom. The second question being founded on an impossible supposition, requires no answer.

Is it possible the querist imagined that the air within the pot, by its increased elasticity and pressure, would finally force the pot up-

wards, forgetting that the pressure of the water downwards on the outside, increases as fast as that within.

So far, however, from this being the fact, it will easily be perceived that if the pot should sink more than 850 times 33 feet, and thus the air be compressed into less than $\frac{1}{850}$ of its former bulk, its specific gravity would be greater than that of water, and, therefore, sink by its own gravity to the bottom, never to return, even if the pot should be drawn up by force.

Nay, further, if the sea is 14 times the above depth, a mass of air at the bottom of it would be pressed into a space 14 times 850 times less than it occupied at the surface of the earth, and so be equal to mercury in its specific gravity. For air is 850 times lighter than water, and water is 14 times lighter than mercury, and so far as experiments have been yet carried, the density of air is in proportion to the weight put upon it. J. P. ESPY.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Improvement in the Steam Engine.

MR. EDITOR,—It is pretty generally admitted that a *deficiency of water* in steam engine boilers is one of the most frequent causes of their explosion. The rapidity with which iron when heated may be oxidized by steam, and the nature of the products thus formed, are well known. When the water in the boiler is suffered to sink below the surface upon which the fire immediately acts, this oxidation takes place, the metal becomes *burned out*, and eventually yields to the force of the confined steam.

The most common method, at present, of ascertaining the state of the water in the boiler, is by means of *gauge cocks* placed one above the other in the front of the boiler. As these indicate either an excess or deficiency of water, the *hot water pump* is accordingly adjusted.

When an engine runs regularly, it is not difficult, by this means, to make the supply of water to the boiler equal to the evaporation. This method, however, under the charge of a skilful engineer, requires his utmost care and attention. Every variation that takes place with regard to the load with which the engine labours, or the velocity with which it runs, tends to disturb the equilibrium (between the supply of water to the boiler and the evaporation,) attained by any previous adjustment of the pump.

When a temporary stoppage of an engine is necessary, as for taking in or discharging passengers, the fire is rarely abated to such a degree as to prevent all further evaporation. The supply from the pump being now *cut off*, the water in the boiler sinks rapidly, and, in all probability, *as delays, though dangerous, are not uncommon*, before the machinery is worked again to replenish it, the mischief is over.

From the foregoing brief description of the present method of

regulating the *feed* of the boiler, and the difficulties attending it, it will be obvious that in the hands of a careless and inattentive engineer, its purposes must be often defeated.

With a view to lessen the number of these accidental explosions, the following contrivance has been *recently patented*, for enabling the engine to regulate for itself its own proper supply of water to the boiler.

In the *pipe* which conveys the water to the *hot water pump* of the engine, I propose to place a cock or *valve;* the latter, however, and of the kind denominated the *throttle-valve*, is recommended. This valve is a circular plate of metal, made to fit the bore of the pipe, and is moveable upon an axis, which passes diametrically across the plate; on the end of the axis which comes through the pipe, a small *handle* is fitted to communicate motion to the valve, which being turned edgeways in the pipe, presents scarcely any resistance to the passage of the water to the pump; but when turned flat across the pipe, closes the bore. This kind of valve may be fitted, without any *extraordinary care*, sufficiently accurate to answer its purpose.

To operate upon this valve, a *float*, attached to the end of a *rod*, is placed on the surface of the water in the boiler, the other end of the rod is connected with an axis or *spindle*, upon which the float works as a centre. This spindle may be fitted in a small *cap* placed upon the top of the boiler, but in many cases the lower end of the tube of the *safety valve*, or of the *steam pipe*, will be found convenient. On the end of this spindle, which is made to protrude a few inches on the outside of the boiler, another rod termed the *index*, is fitted and connected with the handle of the valve above mentioned.

It will be understood that the stroke of the pump must be adjusted to furnish the *greatest quantity* of water the boiler may at any time require: that the length of the *rod*, *index*, and *handle* of the valve are so apportioned to each, that when the *float is at, or near*, the lowest point to which it is thought prudent to allow water in the boiler to subside, the valve shall then be entirely open, and a free passage given for the *maximum quantity of water* to pass into the chamber of the pump. But when the float is at the highest allowable point, the valve shall then be closed, and the supply of water to the pump, and *consequently* to the boiler, cut off.

Under these circumstances it will be readily seen that so long as the operation of the engine is continued, this contrivance must keep the surface of the water in the boiler *always* between the above prescribed limits, whatever may be the rate of the evaporation, or of the running of the engine.

The index, as its name imports, will serve constantly to inform the engineer, and others, of the condition of the water in the boiler. A scale may be placed aside of it for the purpose of pointing out the several rates of evaporation, and also to show when the engine, or *hand pump*, if it is provided with one, should be worked to replenish the boiler when the water is getting low during temporary stoppages. On boats, this part of the contrivance should be made as *public as possible.*

The above described apparatus, it is believed, will, by keeping the water in the boiler constantly at any level that may be desired above the action of the fire, prevent (as I have hastily endeavoured to show) one of the most frequent causes of explosion.

As the pumps of an engine are liable to become defective, the supply and feed pipes to get choked, &c. in some of which cases the safest mode of proceeding is to put the fire out as quickly as possible, I therefore suggest that the *lever of the safety valve* be made slanting, or inclined; that the weight to be suspended on it be retained by a *spring* or *lever hook;* and that this hook be connected with the index of the float, and so adjusted that when the float has sunk to any certain point, considered dangerous, the weight on the lever shall become unhooked, and allowed to *slide nearer the fulcrum.* The noise of the steam *blowing off* at the safety valve will act as a *tell-tale*, or *alarum*, to call the engineer to his duty. The float may be otherwise made to act upon a *small cock* in the boiler for the same purpose.

The descent of the weight may be very readily made to close a damper; to let *fall the grate bars of the furnace, &c.* instantly, or at any *reasonable time, after* the alarm has been given, and thus by putting out the fire, prevent all danger, and any injury the boiler might otherwise sustain.

The self-acting feeder that has just been described, it is thought, will tend much to the *preservation of all boilers* to which it may be applied. It differs from other contrivances for a similar purpose, in being applicable as well to *high* as to *low* pressure engines, requires no waste pipes, &c.

Very respectfully, yours, &c.

CHARLES POTTS.

Philadelphia, June 23d, 1830.

P. S. Individuals who may feel disposed to attach the self-acting feeder to their engines, can have it put up in a neat and substantial manner, and at a moderate expense, by applying at the establishment of Messrs. Rush and Muhlenberg, Bush Hill, in the vicinity of the city of Philadelphia. C. P.

On the Explosions of Boilers of Steam Engines. By M. ARAGO.

[From the Annuaire du Bureau des Longitudes, 1830.]

TRANSLATED FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

(Concluded from page 414.)

Explanation of the explosions which are preceded by the opening of the safety valve, or by a diminution in the elasticity of the steam.

How does it happen that a boiler bursts at the very moment of the opening of the safety valve? How does it happen that this accident is almost always preceded by an apparent diminution in the elasticity of the steam?

These questions, involving seeming paradoxes, are suggested by the accidents recorded in this paper.* Mr. Perkins has, I think, answered them satisfactorily, and I shall lay before the reader the explanation given by that engineer.

In a boiler of the common construction, when the flame from the furnace does not rise higher than the level of the water within, the metal and the liquid inclosed are of the same temperature. This is no longer the case when there is not a proper supply of water in the boiler, and when the flame rises high; then, parts of the boiler may be heated even to redness; in such a case, the steam in contact with the intensely heated metal would become very hot, and yet not acquire great elasticity, either because it is not fully saturated with moisture, or from another cause which I shall explain hereafter.

The water within the boiler being thus low, and the steam which presses upon its surface very much heated, but of little elastic force, suppose the safety valve to be opened: a copious discharge of steam takes place; the water relieved from the pressure upon its surface, rises up in foam, the action being similar to that which takes place in a Champaign bottle on drawing the cork; the water thus thrown in small drops into the midst of an intensely heated vapour, flashes into highly elastic steam, the safety valve not affording a sufficient vent for the discharge of the steam, the boiler is rent.

There are three hypotheses in this explanation. The first is, that the part of the boiler, above the level of the water within, may become intensely heated, and may communicate heat to the steam within, without affecting, materially, the temperature of the water upon which this steam rests. The second is, that boiling water is projected to a certain height in the form of froth as soon as the elasticity of the steam pressing upon its surface is suddenly diminished. The third, that water thus disseminated through a mass of heated steam, is itself suddenly flashed into steam.

No one, I think, will refuse assent to the first hypothesis. If a metallic vessel placed upon a fire does not become heated to redness, it is because the water within, continually deprives the metal of the heat which it receives from the fire, thus preventing an accumulation of heat in the metal. Steam could not produce this effect in the same degree. If the flame from the furnace should play upon a part of the boiler above the level of the water within, this part might become heated to redness, and communicate its temperature to the steam in contact with it; this stratum of steam, in its turn, would communicate the same temperature to an adjacent stratum, and so on, until the heat should be disseminated through the body of steam occupying that portion of the boiler not containing water, that is, through the steam reservoir. There are examples of these effects. Mr. Moyle, in visiting his engines in Cornwall, found that one of the boilers had become so hot that a wooden scale resting *upon the top* of the boiler had taken fire. A similar occurrence took place on board of one of the packets between Liverpool and Dublin; a pine board, accidentally thrown upon the cover of the boiler, took fire. I have already stated,

* See vol. v. page 403.

that before the accident at Pittsburgh, the engineer had observed, for some days, that one of the boilers became heated to redness. I will now give a direct experiment of Mr. Perkins, upon this subject.

A cylindric boiler, of four feet in length, and one foot in diameter, having been placed, vertically, over a furnace, the base was surrounded by a fire, which rose to one-third of the height of the cylinder, while the water occupied but one-sixth. Thus two-sixths of the surface of the vessel were exposed to the heat, one-sixth above, the other below, the level of the water within. The safety valve loaded with about one atmosphere, was placed in the side of the boiler, half way up. Water was supplied to the boiler so as to make up for the loss from the escape of steam.

A thermometer immersed in the water, and going down to the bottom of the vessel, indicated a temperature of 104° (219° Fah.) The temperature of the stratum of steam resting upon this water was the same, but half way up the boiler a thermometer stood at 260° (500° Fah.) and the metal was *red hot.*

The first hypothesis being established, we pass to the second.

There are liquids which, when boiling, are thrown upwards with violence; sulphuric acid is one of these; milk is another example, but the commotion is not so violent as in the case of the acid. If we examine, attentively, water while boiling, we shall see that, at times, small drops are thrown upwards to some distance. This action depends evidently upon the viscous nature of these liquids, and on the difficulty with which steam, generated at the lowest part of such liquids, finds its way through them. When the quantity of confined vapour is great, and it is prevented from escaping by a pressure upon the surface of the liquid, it is easy to see that if the pressure be suddenly removed, instead of rising gradually, as in ordinary circumstances, it will escape very rapidly; that the liquid will froth, as though impregnated, under pressure, with a gas, will become a kind of foam, consisting of water and steam, will have its bulk very much increased, and will expand throughout the boiler. A direct experiment, made in a transparent vessel, would show how far these deductions are correct; wanting this, we conclude by reasoning from analogy, that, as Mr. Perkins asserts, in case of a sudden diminution in the elasticity of the steam within the boiler, the water may rise above its level, and its foam may fill the whole of the steam reservoir.

Let us pass to the third hypothesis of the American engineer, viz. the *sudden* conversion of water into steam. Here we shall have direct experiments to guide us.

Mr. Perkins having filled one of the metallic cylinders, which he terms generators, with water, raised its temperature to 500° Fah. By the side of this cylinder was placed a close receptacle containing neither water nor dense vapour, its temperature being about 650° Fah. These two vessels communicated through a tube, usually closed by a valve.

It is evident that if, by means of a forcing pump, a small quantity of water be thrown into the generator, an equal quantity of the hot

water within must be forced out, and opening the valve connecting the generator with the receiver, must pass into the latter, when, by the use of a properly adjusted valve, it might be made evident whether the water was converted suddenly into steam or not.

Mr. Perkins states that the conversion of the water into steam was instantaneous; that the injection pump had hardly made its stroke, when the valve of the recipient indicated a pressure, from the elasticity of the steam within, of forty atmospheres, when a moderate quantity of water was injected, of one hundred, when the quantity injected was great.

If this experiment had been made with water heated to from 212° to 250° Fah. it would show, exactly, what must take place in a boiler of the common kind. Since the temperature of the water used, 500° Fah. is far below that of steam, having an elastic force equal to 100 atmospheres, this experiment further shows that a portion of the water has flashed instantly into steam, on leaving the generator.

It cannot be inferred from the experiment just given, that the water is flashed into steam by the agency of a very rare steam, the temperature of which is that of red hot iron. This part of the opinion of Mr. Perkins, as has been remarked by M. Dulong, could hardly be reconciled with the known laws of the specific heat of steam. We are, therefore, induced to believe that the American engineer was wrong in supposing, that the heated metai had no direct agency in the results observed.

Let us now examine whether, setting out with the fact of the sudden conversion of water, in contact with intensely heated metal, into steam, we can give a satisfactory explanation of all the accidents which have been detailed in the former part of this paper.

The explosion described by M. Gensoul* confirms precisely the view taken by Mr. Perkins. It may be explained by supposing that on turning the cock, thus giving vent to the steam in the boiler, the water, suddenly relieved from the pressure which it had borne, rose in foam within the boiler, and being thus thrown in contact with the faces of the boiler, which were, probably, highly heated, it was converted so rapidly into steam, that the cock did not afford a sufficient vent for its escape.

The same reasoning applies to the experiment of MM. Sabareau and Rey,* for their boiler being very small and exposed directly to a charcoal fire, the part above the level of the water might have been surrounded by flame. In the experiment† made by M. Dulong and me, no increase of pressure resulted from opening the safety valve, because, the boiler being large, and the opening through which the steam issued small, the elasticity of the steam within was very gradually diminished; besides which, the boiler was placed upon a bed of masonry, and only the part containing water was exposed to the fire. The diminished action of the engine, which preceded the explosion at Essone,‡ the one at Paris,§ and that of the Etna in America,‖ seems to me to be accounted for naturally, by the cause assigned for it by

* See vol. v. page 404. † Ibid 405. ‡ Ibid. § Ibid. 404. ‖ Ibid. ¶ Ibid.

Mr. Perkins. It has been seen, that when the explosion has happened in consequence of some defect in the feeding pump, or in the pipe leading from it to the boiler, the level of the water in the boiler was lowered; now the quantity of steam, generated in a given time, depending upon the extent of heated metallic surface in contact with the water, if this extent were calculated, at the original level of the water in the boiler, to afford a due supply of steam to the engine, it follows that when this extent has been diminished, by a reduction in the level of the water, the boiler can no longer furnish a quantity of steam sufficient to supply the wants of the engine. It might be supposed that the increased temperature of the steam, produced by contact with the heated sides of the boiler, by increasing its elasticity, should compensate for the diminution in quantity; it is easily shown that this cannot be the case. The steam contained in a given vessel must every where be of the same elasticity. The elasticity of the stratum of steam in contact with the water in the boiler, is determined by the temperature of that water; the upper strata must have the same elasticity with the one in contact with the water, hence the steam heated by contact with the sides of the boiler, must have an elasticity determined by the temperature of the water. The boiler will contain steam of a density less than that of saturated vapour of the same elasticity; this is all that can take place.

Mr. Perkins supposes, that the very moment in which the explosion takes place, is that at which the safety valve opens; the steam within the boiler has then reached the limit of elasticity under which the engine was to work; at this very limit the piston of the engine must move slowly, for the steam, being much warmer than the metal of the engine, must lose much of its heat, by imparting it to the cooler metal, and therefore much of its elasticity.

It would, I think, be fruitless to endeavour to determine from this, or from any other theory, the form of the line of rupture of the boiler, the number and size of its fragments, the directions under which they will be projected, &c. &c. A thousand circumstances would modify these results, in ways which it would be difficult to determine, even if the action took place slowly and before our eyes. It happens, however, so often that the line of rupture is horizontal, that it appears natural to suppose this line to have marked the level of the water within the boiler, at the time of the explosion, and therefore it is a curious question to determine why this line, notwithstanding the inequalities in thickness of the metal at different points of it, should be the line of least resistance. This fact can, I think, be explained as follows.

At the very instant which precedes an explosion, the elasticity of the steam is very much, and very suddenly, diminished. This must produce a flexure in the boiler towards the interior; but, as this motion is communicated suddenly, the inertia of the liquid will prevent its immediate effect upon that part of the boiler which contains water, since this inertia cannot be at once overcome.

The boiler will then be caused to bend inwards, along the line of level of the water which it contains. But we have seen that the

formation of a highly elastic steam follows immediately the opening of the safety valve; by this steam, the sides of the boiler will be pressed outwards. Now even if we suppose this force to act, at the same instant, equally on every part of the boiler, still that part containing the liquid will not yield at once to the impulse, for reasons stated in considering the inward flexure. The level of the water in the boiler, before the explosion, will therefore trace, upon the faces, the line in which the flexures, both inward and outward, ceased to produce an effect, the only line along which contiguous particles of metal have not the same motions. We need have seen but once the ease with which plates of metal are broken, by bending suddenly in contrary directions, along a certain line, to understand why the line of level of the water within the boiler, inasmuch as it is the hinge about which the two flexures take place, should usually be the line of rupture, although, as at Lyons, it would not be, if we had regard only to the thickness of the metal, every where the line of least resistance. It is important further to remark, that this is the line along which the metal becomes of a higher temperature than the water within, and which consequently divides the boiler into two parts of very unequal tenacities.

The almost simultaneous explosion of several boilers employed in supplying the same engine, was noticed, in a former part of this paper, as a fact worthy of attention, and one which it was important to be able to explain. Would this explanation be difficult, if we admit, with Mr. Perkins, that an explosion is generally produced by the depression of the level of the water in the boiler, and the heating of the metal above this level? Might we not say that these circumstances generally occur at the same time in the several boilers? since they are fed by the same pump, and since, as soon as the engine moves slowly, the firemen would naturally urge the fire in each furnace. This being the case, let us suppose that one of the boilers bursts on the opening of its safety-valve. The pipe, through which steam passed from this boiler to the cylinder of the engine, is open to the air; each boiler has a similar pipe, and all terminate in one and the same pipe. By this means, the second, third, &c. boilers communicate with the atmosphere; the steam which they contained pours forth through this wide opening, and, in an inappreciably small portion of time, the circumstances producing explosion are to be found in each boiler, without the necessity of supposing that the safety-valve of each was raised at the same instant.

I have spoken* of a boiler which exploded in the air. In all probability, when that at Lochrin burst, it was twelve or fifteen feet above the bed of masonry which usually sustained it. Although this fact can be equally well explained, by several theories which have been advanced to account for explosions, and therefore cannot determine us to adopt one of them rather than another, still it may not be superfluous to show that it can be perfectly well explained by that of Mr. Perkins.

* See vol. v. page 406.

The supposition was an erroneous one, that a boiler composed of metallic plates, must, necessarily, remain in its place, when an opening should be made in any part of it. This error, into which, for example, many of those who contrived the portable gas lamps fell, might cause severe accidents. It is true, that a vessel completely closed remains at rest, whatever be the elasticity of a gas within it; but this is because the pressure upon any point of the vessel is exactly counterbalanced by that upon the opposite point. The effect of a pressure from within, upon the top of a vessel, tends to raise the top, and, if the force were sufficient, the top would rise, were it not that the pressure upon the bottom, in a contrary direction, is exactly equal to, and destroys, the first force. Now it is evident that the same effect is produced, whether we destroy this downward force or take away the part of the boiler which served as its support.

The unresisted force which produces motion in cases analogous to the preceding, is called *reaction*. An example of the effect of this force, is afforded in the flight of the rocket; the gas resulting from the inflammation of the powder, finds on one side no resistance, and on the other a base against which to act, it therefore drives the rocket forward by virtue of this action. These preliminaries established, a few words will suffice to show how, according to the theory of Mr. Perkins, a boiler may explode in the air.

The explosion is, according to this theory, always preceded by a copious formation of steam. When this steam escapes through the safety valve, placed, as it generally is, upon the top of the boiler, the *reaction* of the steam tends to press the boiler more firmly upon its bed; but if the steam escape through some fissure in the lower part of the boiler, the boiler may be projected upwards, being then acted upon by a force directed similarly to that which produces the flight of a rocket. This effect must take place if the elasticity of the steam should be sufficiently great. Add to this, that the change of situation of the boiler, producing a corresponding change in the position of the liquid within, cannot fail to give rise, independently of other causes already mentioned, to the instantaneous production of steam, which causes an explosion.

It seems then, that the theory of Mr. Perkins explains satisfactorily, all the examples of explosions which I have been able to collect, which were preceded by a decrease of elasticity in the steam. Since, in addition to this, the theory is not at variance with known physical laws, we ought immediately, if not to adopt it, at least to take the precautionary measures which it suggests.

These measures are very simple.

To prevent by every means in our power, for example, by the use of fusible metal plates, any part of the boiler from becoming heated too highly.

To pay the greatest attention to those means by which the boiler is supplied with water, or to those which indicate the level of the water within the boiler.

If, notwithstanding the precautions of the engineer, parts of the

boiler should become too intensely heated, to avoid every abrupt opening of the valves, or operations of an analogous sort, which will permit the steam, already generated, to flow rapidly into the air.

Lastly, in such a case to put out the fires as quickly as possible.

Comparison of the explanation given by Mr. Perkins with those offered by other engineers; new causes of explosions.

Although I have presented in detail, and under a favourable point of view, the explanation given by Mr. Perkins, of the causes of the dangerous explosions, which, notwithstanding the good condition of the safety valves, too often occur, I am far from considering this explanation so conclusive as not to admit of a doubt, and, in consequence, to suppose the subject exhausted. I will, therefore, now present views upon the same subject, which I have derived from the printed and manuscript works which I have been able to consult, and also will subjoin a notice of certain causes of explosion, not spoken of by the American engineer. I shall then have completed the task which I proposed to myself, namely, to give as complete a statement as was possible, of the information which has been acquired, in relation to these distressing accidents: those who may deem it necessary to extend this knowledge will know the point from which they should begin.

One of our most skilful naval constructors, M. Marestier, has offered a theory, in relation to the particular kind of accident which Mr. Perkins had in view, which, viewed as a whole, has some analogy with that of the American engineer; there is one point, however, upon which these authors differ essentially.

M. Marestier admits, with Mr. Perkins, that for some time previous to an explosion, the boiler has not received a sufficient supply of water; that one portion of the metal thus receiving the direct action of the fire, without being in contact with water, becomes heated, perhaps even to redness; that, at the moment in which the safety valve opens, or an accidental escape of steam takes place, the surface of the water is disturbed, as has been already explained, either in consequence of the violent ebullition caused by a diminution of pressure within the boiler, or by the flexure of the boiler inwards, which lessens its capacity. M. Marestier further supposes, that the water thus raised, coming in contact with the heated metal, is suddenly flashed into steam, and in such abundance, that the safety valve cannot give vent to it. In the boilers of steam boats, in certain cases, the motion caused by the waves tends to bring the water in contact with the heated metal.

The reader may recollect that Mr. Perkins attributes the sudden production of steam, to the projection of water into steam of a very low density, but intensely heated; whilst that, according to the explanation of M. Marestier, just given, it is the heated metal which suddenly flashes the water, thrown into contact with it, into steam. Nothing at first sight could appear more in accordance with reason than this hypothesis of M. Marestier, but in natural phenomena, as has been wisely remarked by Fontenelle, "as soon as two different

causes may be supposed to account for an effect, the true cause is generally that which at first seems the less probable." It is the fact, however strange it may appear, that metal heated to redness does not rapidly convert water into steam. If a drop of water be placed in a vessel heated to a white heat, its conversion into steam requires a long time, while it disappears at once if thrown into the same vessel when but moderately heated.

The only experiment which I shall cite upon this point, is that of Klaproth: a drop of water thrown into an iron spoon, heated to a bright red heat, required 40 seconds for vaporization; at the end of this time a second drop let fall into the same spoon, now partially cooled, required but 20 seconds for vaporization; a third drop disappeared in 6 seconds, a fourth in 4, a fifth in 2, and a sixth in an inappreciably small portion of time. Notwithstanding these curious observations, I have already stated, (page 47,) that the *intensely heated* metal of the boiler appears to me to play the principal part in that sudden transformation of water into steam, which causes an explosion: it must be admitted, however, that, to complete his theory, M. Marestier should be able to explain, why the water within a boiler acts differently from the drops in the experiment of Klaproth. If it were found that a drop of water, thrown violently against an intensely heated plate of metal, is instantly converted into steam, all our doubts would disappear, and the explosion of the boiler, known to have been heated to redness, at Pittsburgh, would no longer seem an anomaly, requiring new causes to be sought for its explanation. In conclusion I would remark, that Messrs. Perkins and Marestier only differ upon a point of theory. The fact of the sudden conversion of water into steam, determined experimentally by the former, is admitted by the latter, and with regard to the precautions to be taken to guard against explosion, it is of no consequence whether the heated metal acts directly or indirectly, in the formation of steam. The same care should be taken to prevent the boiler from becoming too highly heated, and if it should become, by accident, thus heated, to prevent the sudden opening of the valves.

M. Gensoul, whose name is so honourably connected with the progress of the useful arts at Lyons, explains very differently from Mr. Perkins or M. Marestier the explosive effects produced sometimes by the sudden opening of a safety valve. The following may be considered an outline of M. Gensoul's theory.

When a metallic tube is filled with a liquid very strongly compressed, a slight blow upon the face of the tube will cause it to burst, while a great increase of pressure gradually applied might have failed to produce such an effect. This fact is well known; M. Gensoul thinks it may be extended so as to apply to boilers. In his view, when the faces of a boiler have been pressed with great force, by the steam within, they should break by a small percussive force, just as if they contained a liquid subjected to great pressure; now he thinks, that the part of a boiler diametrically opposite to that on which the safety valve is placed, must experience a sort of percussive action when the valve opens suddenly, allowing the escape of steam. If,

for example, the safety valve is on the top of a boiler, the bottom will receive the percussion on the opening of the valve; if the right side of the boiler should have the safety valve attached to it, then the left would be struck, &c. &c.

This ingenious explanation raises several doubts in the mind. First, it appears by no means evident that, the interior pressure being the same, a blow can produce the same effect upon a vessel filled with a liquid and with a vapour; the incompressibility of the liquid may be of some importance in this action. Secondly, M. Gensoul supposes that before the explosion the boiler is filled with a highly elastic vapour, while, on the contrary, we have seen that such accidents often happen when the engine is working very slowly. The explanation seems at least incomplete. We may, therefore, conclude, that in cases of sudden rupture, the reaction of the steam escaping can produce no important effect; I have pointed out (page 50) the kind of accidents which may be produced by this cause.

Some persons, struck with the instantaneous effects produced by the explosions of boilers, have been induced to think that steam alone could not produce them, and have called to their aid gases capable of exploding. Why, say they, since, in the laboratory, hydrogen gas is obtained by passing the vapour of water through an iron tube heated to redness, will not the same gas be produced within a boiler in which the steam is sometimes in contact with metal heated to redness? We grant that this would account for the production of this gas. Mixed with steam, this gas will pass into the cylinder of the engine, from hence, as it is not capable of condensation, it will be expelled at a great expense of power, and the effect will be to retard the working of the engine. I will admit, if necessary, that this is usually the cause of the retardation in the working of an engine, just before an explosion, in the kind of accidents which we have been engaged in discussing; but how is this explosion produced? Hydrogen alone, or when mixed with steam, cannot explode. A mixture of hydrogen and oxygen gases, in proper proportions, will explode; but how are these gases to be produced within the boiler? The hydrogen is produced by the decomposition of water by the heated metal, which is thus oxidized; from whence then can the oxygen come? Perhaps, it may be said, from the atmospheric air contained in the water which feeds the boiler; but we may answer that this water is generally warm, that it contains, therefore, but a small quantity of air, and moreover that this air, as fast as it is disengaged from the water, passes in a state of mixture with the steam, into the engine. Further, it may be added, that the oxygen of this air would combine with the heated metal more readily than that contained in the water would do, and thus if hydrogen gas should be produced from the water, it would find nitrogen present with which to mix, but no oxygen. If even this difficulty were disposed of, we should be no further advanced. The only means known by which hydrogen and oxygen gases can be made to unite with explosion, are a solid body heated to redness, flame, and the electric spark. Boilers have burst without having reached the temperature

of redness required to produce an explosion. Flame is still further out of the question. There remains the electric spark; from whence shall we derive it? I know it has been said that the explosion of the boiler of the steam boat Enterprise, of Savannah, was caused by an electric discharge, to which the smoke from the chimney of the furnace had served as a conductor; but, supposing this to have been the case, we have no evidence that the lightning found a mixture of hydrogen and oxygen gases in the boiler, or that it did not act as it usually does, rending asunder every thing which it meets. But even admitting, with the partizans of the theory which I have just explained, that the electric spark may possibly be the cause of an explosion, I cannot persuade myself that this agent can be supposed to act, I will not say in all, but in the one-hundredth part of the cases of explosion.

Discouraged by the difficulties of uniting, in the same boiler, the gases necessary to form an explosive mixture, some engineers have supposed but one formed, hydrogen; that this gas, after the bursting of the boiler, mixing with the air in the furnace, explodes. Thus the detonation of the gases is not considered as the cause of the explosion, but as adding to the violence of its effects: this explosion taking place in the furnace would project to a great distance, the whole boiler, or its fragments, with those of the furnace. What can I say of these views, but that not a single explosion has occurred in which it has been ascertained that hydrogen, contained within the boiler, has contributed to produce it.

Let us now examine whether, as many engineers have supposed, the elements to produce detonation may not be found in the furnace itself.

According to these engineers, carburetted hydrogen will be produced from the coal, as in the apparatus for procuring coal gas, and pure hydrogen, if necessary, by the decomposition of the water, which finds its way between the imperfectly fitted plates of the boiler and falls upon the coal. As for the oxygen, without which there could be no explosion, it is derived from that portion of the air supplied by the draught, which passes through the fire without being entirely deprived of its oxygen.

The bright columns of flame, sometimes seen at the tops of the highest chimnies of furnaces, show that the gas drawn up by the draught may sometimes form an explosive mixture. If such a mixture should be formed in some corner of the flue, its explosion must be feared. If this explosion should be violent, it is difficult to conceive how the boiler could resist it.

I have already stated how an explosive mixture might be formed in the furnace itself. I must add, that there are certain accidents evidently produced by this cause, I mean the explosions of evaporating pans entirely open at the top. I am informed by M. Gay Lussac, that the furnace of a saltpetre refinery at the Arsenal of Paris, was recently destroyed entirely, by an explosion of this sort; the boiler remained uninjured.

To prevent such accidents, ascending and descending elbows in

the flues should be, as much as possible, avoided; for it is principally in these elbows that inflammable mixtures can be lodged. It is also necessary that the register of the flue should not shut too tightly, as I have explained already.* Lastly, to avoid the disengagement of combustible gas from the coal, without its being burned at the instant of its production, care should be taken to have interstices between the bars of the grate of sufficient size. If the coal is rich in bitumen, it cakes, the different pieces become so agglutinated as to form a crust, which, when very thick, is almost impervious to flame. The furnace becomes then a true apparatus for the distillation of the coal, much inflammable gas is produced, and but little heat. The coal should, therefore, be placed upon the grate in thin layers, not only from considerations of economy, but actually from those of safety. The firemen who through laziness encumber the grate with coals, retard the working of the engine, expose it to the most serious accidents, and risk their own lives: they cannot be watched, therefore, with too much care.

To complete my task, there remains but to mention a last cause of explosion, which is not without importance.

The water used to generate steam is very seldom pure. Usually this water contains saline matters, which are deposited by boiling, and which form upon the interior of the boiler a hard crust, which increases in thickness every day. Before the existence of this crust, the heat absorbed by the metal was rapidly transmitted to the water, and the boiler could never acquire a very elevated temperature; as soon as a substance which conducts heat but slowly, as is the case with the saline deposit supposed, lines the interior of the boiler, the heat reaches the water but slowly; the metal receiving, every instant, more heat from the fire than the saline deposit takes from it, becomes more and more heated, until at last it may become red hot; this is not only attended with a great loss of heat, but with great danger, for the metals when intensely heated lose much of their tenacity. We can easily see, besides, the danger lest the comparatively cold water of the boiler should, through some fissure in the saline crust, come in contact with the heated metal. In such a case a boiler of cast metal would, probably, instantly give way, and one of wrought plates would be very much strained, even if its strength prevented its bursting. I may add, that the portions of metal thus heated become oxidized very rapidly. As an example may be cited, the boiler intended to warm one of the noblest works of our capital, in which a hole was burned in the lower part, in the place upon which a workman had, by accident, allowed a cloth to fall.

We thus see how important it is that the boiler should be kept clean. In steam boats which use salt water to supply the boiler, the saline deposit should be removed every twenty-four hours, if not oftener. When the water used is pure, this operation is only necessary at considerable intervals of time. No general rule can be given on this head; the engineer should determine, experimentally, in

* See vol. v. page 405.

what way, and how rapidly, the saline elements are deposited, from the water which is used in the boiler of which he has the charge. Since the discovery that potato starch and malt prevent these deposits from taking place, it has been proposed to throw a certain quantity of these substances, from time to time, into the boiler; but I do not know that this practice has extended very widely.

I regret that it is out of my power to give an account here of the ingenious researches which M. Tabareau has made on the subject of explosions, the results of which he has presented to the Academy; it seems to me necessary to await the modifications in his theory, which he himself has thought necessary.

I ought not to conclude so long a paper on the subject of the explosions of steam boilers, without explaining why I have not separated the examples of the explosions of high pressure boilers from those of the low pressure; it is because I think there is no reason to make such a distinction. Every one must in fact admit, that at the time of an explosion, all boilers contain high pressure steam. I may add that it does not appear established by any means, that explosions take place more frequently in high than in low pressure boilers; the contrary has been maintained by different engineers, among whom may be classed Messrs. Perkins, Oliver Evans, &c.

One of my friends, after having read this article, expressed to me a fear lest so detailed an account of the various causes which might cause the explosion of a boiler, should destroy the confidence of many in the steam engine. If this essay were calculated, in my opinion, to produce such an effect, I should have been anxious to suppress it; but I cannot feel any apprehension that such an effect will be produced by it, for if it should be read with a little attention, as I have a right to suppose, the reader will see that no cause of explosion exists which cannot be avoided, by means at once simple and within the reach of every one. As we should not trust fire-arms in the hands of children, so, I think, we should not trust the direction of a steam engine to a man either unskilled, without experience, or wanting in intelligence. It is a very mistaken idea, that because steam engines usually move without attention to them, such attention is not required; Watt contended strongly against this error, and if my article should contribute to render it less common, I shall think the pains which I have taken well bestowed; such was the sole end and object of my essay.

Description of the Microscopic Doublet, invented by the late Dr. W. H. Wollaston. *Extracted from the Philosophical Transactions.*

In the illumination of microscopic objects, whatever light is collected and brought to the eye, beyond that which is fully commanded by the object glasses, tends rather to impede than to assist distinct vision.

My endeavour has been, to collect as much of the admitted light

as can be done by simple means, to a focus in the same plane as the object to be examined. For this purpose, I have used, with success, a plane mirror to direct the light, and a plano-convex lens to collect it, the plane side of the lens being towards the object to be illuminated.

With respect to the apparatus for magnifying, notwithstanding the great improvements lately made in the construction of microscopes, by the introduction of achromatic object glasses, and the manifest superiority they possess over any single microscope, in the greater extent of field they present to view at once, whereby they are admirably adapted to make an entertaining exhibition of known objects; yet hardly any one of the compound microscopes which I have yet seen, is capable of exhibiting minute bodies with that extreme distinctness which is to be obtained by more simple means; and which is absolutely necessary for an original examination of unknown objects.

My experience has led me to prefer a lens of a plano-convex form, even when made of glass; but the sapphire lens of this form, recently introduced into use by Mr. Pritchard, has a decided superiority over every single lens hitherto employed.

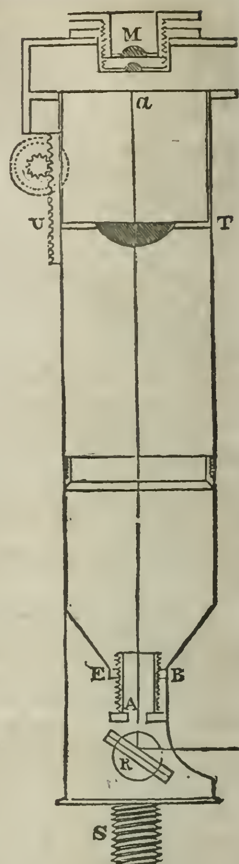
The cost, however, of such a lens, in comparison with glass, as well as the readiness with which any number and variety of the latter kind can be procured, led me to consider what simple combinations of them might perhaps equal the sapphire lens in performance, without great cost or difficulty of construction. And though both Mr. Herschel and Professor Airy have recently applied their superior talents to the analytical investigation of this subject, it seemed not improbable, that the more humble efforts of a mere experimentalist, might be rewarded by some useful results.

The consideration of that form of eye-piece for astronomical telescopes called Huygenian, suggested the probability, that a similar combination should have a similar advantage, of correcting both chromatic and spherical aberration, if employed in an opposite direction, as a microscope.

The construction which I found convenient in my trials, consists of two tubes, fitted one within the other by screwing, and each perforated at the extremity. By this construction, two suitable plano-convex lenses, fixed in these perforations, may, because of their plane surfaces, have their axes easily placed in the same line; and their distance from each other may be so varied, by screwing, as to produce the best effects of which they are susceptible.

As far as my trials have hitherto gone, I am led to consider the proportion of three to one as nearly the best, for the relation of the foci of these lenses; and their joint performance to be the most perfect, when the distance between their plane surfaces is about one and four-tenths of the shorter focus. But as all the lenses I possess are not similar segments of spheres, or of the same relative thickness, I could not expect exact uniformity in the results.

The following is a description of the apparatus which I have employed.



The figure represents a brass tube, about six inches long, and of such a diameter, as to preclude any reflection of false light from its sides; and the better to insure this, the inside of the tube should be blackened. At the top of the tube, or within it, at a small distance from the top, is placed either a plano-convex lens U, T, or one properly crossed, so as to have the least aberration, about three-quarters of an inch focus, and having its plane side next to the object to be viewed; and at the bottom, is a circular perforation, A, of about three-tenths of an inch diameter, for limiting the light reflected from the plane mirror, R, and which is to be brought to a focus at *a*, giving a neat image of the perforation A at a distance of about eight-tenths of an inch from the lens U, T, and in the same plane as the object which is to be examined. The length of the tube, and the distance of the convex lens from the perforation, may be somewhat varied. The length here given, six inches, being that which it was thought would be most convenient for the height of the eye of the observer above the table. The diameter of the image of the perforation A need not, excepting with lower powers than are here meant to be considered, exceed one-twentieth of an inch.

The intensity of illumination will depend upon the diameter of the illuminating lens, and the proportion of the image to the perforation, and may be regulated according to the wish of the observer.

The compound magnifier, M, consists, as before mentioned, of two plano-convex lenses; the proportion of the foci of these lenses being about as three to one. They are fixed in their cells, having their plane sides next to the object to be viewed, their plane surfaces being distant from each other about one and four-tenths, or one and a half, of the length of the shorter focus. This distance should be varied by trial, until the utmost possible degree of distinctness has been attained, not only in the centre, but throughout the whole field of view.

In order to determine the distance between the plane surfaces of the lenses, I have used the following contrivance. A wire is bent so as to form a spring, to the ends of which two small pieces of plate glass are attached. Between the surfaces of the pieces of glass, is placed the interior cell, or that which carries the lens of the longer focus; and the distance between the exterior surfaces of the pieces of glass is to be measured with a pair of callipers: the cell is then

to be screwed into its place, and the compound cell subjected to the same operation; when the increase of distance between the exterior surfaces of the pieces of glass will evidently be equal to the distance between the plane surfaces of the lenses.

The exterior cell of the compound magnifier should be formed with a flanch, so that it may rest upon the piece that receives it. This is a far more convenient method than screwing, and the magnifiers can be more readily changed.

The lens, U, T, or the perforation, A, should have an adjustment, by which the distance between them may be varied, and the image of the perforation be thus brought into the same plane as the object to be examined. This may perhaps be most conveniently done by two tubes, screwing the one into the other.

A stage, for carrying the objects, furnished with the requisite means for lateral adjustments, is fixed at *a*, between the magnifier and the lens U, T. The adjustment for distinct vision, is applied to the piece carrying the compound magnifier.

For the perfect performance of this microscope, it is necessary that the axes of the lenses, and the centre of the perforation A, should be in the same right line. This may be known by the image of the perforation being illuminated throughout its whole extent, and having its whole circumference equally well defined. For illumination at night, a common bull's-eye lanthorn may be used with great advantage.

With this microscopic doublet, I have seen the finest striæ and serratures upon the scales of the *lepisma* and *podura*, and the scales upon a gnat's wing, with a degree of delicate perspicuity, which I have in vain sought in any other microscope with which I am acquainted.

Before I conclude, I would point out one great advantage that has confirmed me in the preference I have given to the use of a plano-convex lens, properly applied; that is, having its plane side next to the object: namely, that if such a lens should touch a fluid under examination, the view is not only not impaired, but even improved, by the contact of the two media; but if a double convex lens be used, and it should accidentally touch the fluid, which not unfrequently happens, when the lens is of short focus, there is an end of the examination, until the lens has been taken out, wiped, and replaced.

Appendix.

The instrument which has been described, will, of course, admit of many varieties of form; I shall, however, add a description of that which has appeared to me to be convenient, and which is represented in the cut. A brass tube, of sufficient length and diameter, forms the body of the instrument; one end of the tube is closed by a piece having a screw S, by means of which it may be fixed in the top of the box intended to contain the instrument, and which thus forms a support for it. A portion of the tube above this piece is cut open in front for the purpose of admitting light to the small plane mirror R, which is attached to a horizontal axis, passing through the diameter

of the tube. The inclination of this mirror may be varied, by means of a milled head, fixed to the axis on the outside of the tube; the other adjustment at right angles being made, by turning the box of the microscope.

Into the tube, above the opening, a conical piece, E, B, is soldered, into which is screwed a small cylindrical tube, carrying the perforation A, before described. The plano-convex lens, U, T, is fixed in a spring tube, which slides into that which forms the body of the microscope. The position, consequently, of the lens, may be varied, so as to bring the image of the perforation into the same plane with the object to be viewed. A piece of plate glass, about two inches square, or less if it be thought more convenient, is attached to the top of the tube, and serves to support a stage, having lateral adjustments at right angles to each other. The piece into which the magnifiers fit, may be moved by a rack and pinion, and great care must be taken to arrange this adjustment, so that the magnifier may move precisely in the prolongation of the axis of the tube. The tube is divided into two pieces of equal lengths, which screw into each other at the middle; and which, when taken asunder, will allow of the whole instrument being packed in a box, about four inches square.

Supposing the plano-convex lens to be placed at its proper distance from the stage, the image of the perforation may be readily brought into the same plane with the object, by fixing temporarily a small wire across the perforation, with a bit of wax; viewing any object placed upon a piece of glass upon the stage of the microscope, and varying the distance of the perforation from the lens, by screwing its tube, until the image of the wire is seen distinctly at the same time with the object upon the piece of glass.

On employing Disks of Fusible Metal to prevent Explosions in Steam Boilers. By M. Gualtier de Claubry.

[From De Moleon's *Recueil Industriel.*]

The fatal accident which happened to a steam boat at Lyons, has caused steam navigation to be held in great disesteem, as well as high pressure steam boilers; and notwithstanding the reasons which have been assigned, on the probable causes of the above accident, yet we see that fears are renewed, and, until more certain means of preservation shall have been brought into use, these fears will be productive of great inconvenience.

The explosion of the boiler of this steam boat, has been attributed to the imprudence of the engineer or his workmen, who, in order to start the boat, loaded the safety valves, to increase the force of the steam. M. Clement thinks, that perhaps in this boiler, as well as in that which burst several years since, at the manufactory of M. Ferrey, at Essone, and which was also constructed by the same engineer, Mr. Steel, the openings of the steam valves were of too small a diameter to give passage to all the steam produced. But whatever may have been the causes of the accident, we should endeavour to prevent

a repetition of it; and here an important question presents itself, which merits the greatest attention; namely, can we find, amongst the various safety valves hitherto employed, one which is calculated to preserve us from all the accidents attending the use of high pressure steam boilers.

We have seen long since, that, owing to various accidental causes, the ordinary safety valves do not always act, so as to ensure safety; and the curious observation of M. Clement, respecting the valves of the blowing machine at Fourchambault, which observation perfectly applies to those of steam engines, has proved, that with safety valves of a large diameter, and under a feeble pressure, but a false security is afforded; as truly so as when their levers are loaded by too great a weight. We must, therefore, recur to other means, in order to avoid those accidents which arise from the too strong pressure of the steam.

The disks of fusible alloys, which melt at the temperature required by the pressure to which we would raise the steam, have, for several years, obtained the approbation of the most enlightened men; and positive experiments have proved that their use would be most advantageous.

Nevertheless, a man of science, whose name is of authority, and to whose opinions we should with pleasure defer, has adopted an opinion of a contrary nature; and which would exercise an unhappy influence, were we to suffer it to pass without examination; it therefore seems proper to provoke a discussion on this important subject, one of the most useful kind, and which may produce results that certainly will benefit science.

These disks of alloy are composed of various proportions of the three metals, bismuth, lead, and tin, and which, according to their relative quantities, melt at particular temperatures; and thus, by a fusion more or less complete, open a free passage to the steam, and hinder the fracture of the boiler, which might otherwise experience too strong a pressure; but the greatest care ought to be taken to insure that these disks should produce their intended effect. They should therefore be composed in such proportions, that they should melt at a temperature but little higher than that at which the steam boiler of the machine ordinarily works.

They should also be placed in a situation well chosen, as it is known that in different points of the surface of the boiler, the temperature is not perfectly equal, and that a disk which would melt at one point, will remain solid in another; and thus it is not sufficient to provide disks which should melt at the temperature indicating a pressure of two, three, or four atmospheres, &c., unless we have also well determined the point at which this pressure and temperature exist. For instance, if the safety valve be placed over the fire-place, or at the extremity of the boiler, it is not likely, that under similar circumstances, the disk should always melt at the convenient time, nor if it be placed in a pipe more or less elevated. It seems that the best position for the disk would be over the fire-place.*

* It was in this position that Mr. Trevitheck placed his safety plugs, in the bottoms of his high pressure steam boilers.—Editor Tech. Rep.

This observation agrees with the opinion of M. Clement, who says, in his course of lectures on the applications of chemistry to the arts, that in pursuing the theoretic idea of adopting the use of the fusible disks, we must not only calculate upon their fusion, but also upon their softening; and he exhibited one to his auditors, in which its change of form was visible, and this before it had become soft.

In order to judge of the defect in this disk, it would be necessary to know, in the first place, whether it had been placed in the most convenient situation; and, secondly, whether it was composed of good proportions; two circumstances which might exert a remarkable influence upon its change of figure. When a fusible disk is subjected to steam, at a temperature nearly approaching to that of its fusion, as the alloys, according to the proportions of which they are composed, soften at different temperatures, some small parts of them experience a liquation, which we see appear in the middle of the surface of the disk, in the form of globules, of which the number continually augments, so as at length to form a swelling, resembling the head of a cauliflower, in the midst of which an opening is produced, which affords an issue to the steam: but if the temperature be raised gradually, the liquation will continue, and bulge out the metal, especially in the centre, where the fusion has taken place, but not towards the edges, and thus form a projecting disk.

[TO BE CONTINUED.]

Danger from the premature explosion of Gunpowder in the Blasting of Rocks, with suggestions as to the means of prevention.

The deep interest excited by the following letter, induced me to submit the subject to the consideration of a gentleman whom I knew to have had considerable experience in blasting rocks, and in whose science and skill, I have the greatest confidence. As he has favoured me with an answer, which contains very important suggestions, I am happy to lay it before the public, in connexion with the letter of Dr. Catlin. I have added also, some suggestions of my own.

B. Silliman.

I. *Letter of Dr. Catlin.*

Haddam, Con. August 25, 1829.

TO PROF. SILLIMAN.

Dear Sir,—Being desirous to promote the welfare of my fellow citizens, and to render the situation of those engaged in a hazardous employment, as safe as the nature of the case will admit, I take the liberty to address you for the purpose of obtaining some information, on a subject important to mankind.

It is undoubtedly well known to you, sir, that a large number of men in this place, are engaged in the quarrying of stone. They are under the necessity of using large quantities of gunpowder, for the purpose of liberating the rocks, and injuries have not unfrequently

been received, from premature explosions. But till recently, the injuries have seldom been serious, and the explosion has readily been accounted for, and has, generally, perhaps always, except in the last case that occurred, been owing to the carelessness of the operator. The lives of two valuable young men of this place, have within a few weeks, been destroyed by explosions, which has alarmed us; the last case particularly, as we are unable to discover the manner in which the powder became ignited. I will relate the circumstances: the hole which was charged was eighteen or twenty inches deep, and about three in diameter, and was made by drilling into a solid rock. The spindle used was made of copper, and that it might be easily drawn, it was oiled; a wad of dry tow was first put down, with a wooden rammer, and followed by two wet wads, pushed in with the same instrument. The hole was then filled up a few inches with gypsum, by putting in a little at a time, and pounding it down forcibly with an iron tampering bar, held in the hole and struck upon with a hammer. The spindle was then withdrawn a little, by placing the tampering bar through the ring at the upper end of the spindle, holding one end in the hand, and striking under the other with the hammer; after this, the workman proceeded to tamper down as before, and again drew his spindle as at first, but thinking that it was not withdrawn sufficiently, he gave another blow, and it exploded. The end of the tampering bar, (as is supposed,) struck in his right eye, fractured the orbitar plates of the os frontis, and destroyed life in thirty-six hours.

Now, sir, if you can inform me how the powder became ignited, and how the danger may be avoided in future, you will confer a benefit on all those engaged in quarrying, and much oblige,

Your servant,

BENJAMIN H. CATLIN.

II. *Letter of Mr. Blake.*

Whitneyville, September 5, 1829.

TO PROF. SILLIMAN.

My dear sir,—In blasting rocks, as you know, it is not an uncommon thing for explosions to take place before the charging is completed. Almost every year some of our numerous newspapers give accounts of such premature explosions, attended with fatal consequences to the operators. The cause of the accidental ignition of the powder in these cases, is sometimes clearly indicated by the known circumstances of the case, and at others it can only be referred to the unknown circumstances, which may have attended the operation. I have read with attention the letter on this subject, which you did me the honour to refer to me, which was addressed to you by Dr. B. H. Catlin, of Haddam, giving an account of an accident of this kind, and soliciting information as to the cause of the ignition of the powder, and the means of avoiding similar accidents in future; and shall now with pleasure proceed to state to you my views of the subject, as you desired.

The method of charging the rock, in this case, as minutely describ-

ed by Mr. Catlin, was that which is now most generally practised, and it is perhaps the only method that was in use twenty years since. The workman appears to have used more than the ordinary degree of caution; and I cannot see that there was any thing in the case to produce explosion, which is not liable to exist, in every case, in which this method of charging is practised. In the Journal of Science, vol. XIII. p. 161, are given the results of some experiments tried by M. Aubert, which go to show that violent shocks and percussions, between any two hard substances, may occasion the disengagement of sufficient heat to inflame gunpowder; and it is well known that violent *attrition* is still more favourable to the disengagement of heat than percussion. To both of these the process, as described by Mr. Catlin, is evidently in some degree liable. In tamping down the first quantity of gypsum, which was put in next above the wad, the irregular pressure of those pieces which were in contact with the wad, would be very liable to force the wad down on one side of the hole, or in the centre, which would cause the powder to be thrown up on the other side, or on all sides. The spindle is usually inserted into the powder on one side of the hole; consequently the wadding would not be likely to close the hole entirely around the spindle, and the powder would be, therefore, particularly liable to be thrown up around the spindle. By proceeding with the tamping, this powder would be brought in close and hard contact with the spindle, and in withdrawing the spindle in the manner mentioned by Mr. Catlin, would be subjected to violent attrition, between the spindle and the gypsum, or between the spindle and the rock. Whether this was or was not the precise cause of the explosion, cannot perhaps be determined; nor will it be important to know, if, without this knowledge, satisfactory information can be given in regard to the manner in which the recurrence of similar accidents may be prevented in future.

About twenty years since, another method of charging a blast was proposed and circulated in the newspapers, which, since that time, has been practised to some extent in different parts of this country. This method may be briefly described as follows, viz. After putting in the powder, take a rye or wheat straw, which is long enough to reach from the powder to the top of the hole, and having filled it with powder, insert one end of it into the charge; after which put in a small quantity of wadding, and then fill up the hole with coarse dry sand, simply poured in without any ramming.

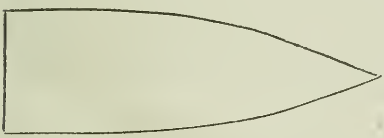
When about ten years since my attention was turned to blasting, I made a trial of this method, with great success in some cases, but without any effect in others. I soon found that when the hole was *deep*, the effect was not only certain, but also more powerful than when charged in the old method. But when the hole was shallow, the sand would generally be thrown out without producing any effect on the rock. When the depth of the sand above the powder is not less than ten times its diameter, I have never known it to be thrown out. In all such cases, therefore, I can from experience recommend this method as one which is perfectly safe and sure, and at the same time more expeditious and more effectual than the old method.

Since my attention has been drawn to this subject by Mr. Catlin's letter, an equally safe method has occurred to me, of securing a blast in holes of less depth. This method is as follows; viz. Having put in the powder, and inserted into it, on one side, the straw filled with powder, as directed above, put in a small quantity of wadding and press it compactly down; then make a cone of wood, the diameter of whose base is a little less than the smallest diameter of the hole, and whose height is a little less than the distance from the top of the wad to the top of the hole. Set the base of this cone on the wad, and then keeping the vertex in the centre of the hole, fill in around it with coarse dry sand. If the hole be very shallow, the sand may be pressed down around the cone with a small wooden rod, but if the length of the cone be eight or ten inches this will be unnecessary.

For the purpose of testing this method, before I proposed it to you, I have, within the last week, made seven trials of it, six of which were successful. The failure of the other, I attributed to the circumstance that the cone was so large at the base as to bind on the sides of the hole. The same hole was afterward charged, using a smaller one, and the blast was effectual.

I have spoken of the piece of wood to be used in this method of blasting as a *cone*. Strictly speaking, however, its form should not be that of a true cone. In a cone, the areas of the sections which are parallel to the base, are as the squares of their distances from the vertex; but the proper form for the pieces of wood, is that in which these areas are not in the *duplicate*, but in the *simple* ratio of the distances from the vertex. This gives the form of the true *paraboloid;* and to this form the workman, in making the piece, should certainly approximate as nearly as convenient; particularly as it respects the main part of the length, from the base toward the vertex. Near the vertex the form will not be so important. It is more conveniently formed, and is perhaps better, to *terminate* in a conical point, rather than in the more obtuse form of the paraboloid.

I here give a longitudinal section, showing on a small scale, nearly the form of the pieces which I used in my experiments.



It will be proper to remark here, that no very great degree of precision will be necessary in forming the pieces, particularly for holes which will receive one as long as eight or ten inches. When the workman has formed a just conception of the proper form, he may make one with sufficient precision, for any depth of hole, with no other instrument but a common axe. The pieces, especially when not more than five or six inches long, should be made of hard seasoned wood. When once made, they may sometimes be used several times in succession, as they will not often be thrown to a great distance; sometimes not even out of the hole. In my experiments I used one piece three times, and another twice.

Though the time occupied in charging in this way, is somewhat

more than it takes to charge in those cases where sand alone may be used, it is still much less than is required to charge in the old method, as described by Mr. Catlin. Should this method, on further trial, be found to be sure and effectual, it will afford as full a remedy as can perhaps be expected, for the hitherto hazardous nature of the employment. With the most respectful consideration,

I am sir, your friend and servant,

Eli W. Blake.

III. *Letter of the Editor to Dr. Catlin.*

Dear sir,—It is perhaps hardly necessary to add any thing, after the able and clear instructions given by Mr. Blake. But as people are more prone to go on as they have been accustomed to do, than to adopt new modes, although improved ones, it may not be amiss to say, that Mr. Blake's method appears to me to embrace all the desiderata, both theoretical and practical, which the case requires.

1. You are aware that *the explosion of gunpowder arises from the instantaneous production of a vast quantity of gases*, which being also expanded by the red heat, cannot be confined, and of course, when not permitted to escape, rend their enclosure. With a given quantity of powder, the tendency of the gases to rend the enclosure, is increased, in proportion as we increase the resistance which we present, tending to prevent their escape; and we modify this resistance, to suit our views, in different cases. In a gun, we add a wad, not only to retain the powder, but to cause its more instantaneous combustion, and to confine the action of the gases in that direction, to the bullet; it is not our object to do more, and if our charge is too great, or the wadding is rammed down too hard, or there is upon it too great a load of metal, the reaction is so violent as to burst the piece. This is a rare accident, considering how many discharges are made by careless people; and we are scarcely aware how much the force of an explosion is increased by even slight resistance. A train of gunpowder laid on a board, burns, as we know, with so little rapidity, that we easily walk or run faster than it goes; but, if another board be laid over the train, and weights placed upon it, although still open at the sides, the powder then burns with amazing rapidity. Powder merely flashes in the pan of a musket, but the same powder placed in a quill, burns vehemently; still more fulminating mercury, which also flashes, (although with intense brightness,) when fired in a heap, explodes with great violence, in a quill.

2. *Our object, then, is to repress the force to such a degree as to accomplish our purpose*, which, in fire arms, is to give velocity to a ball; but, in the case before us, it is to rend asunder the surrounding matter. In the old method of blasting rocks, this was most effectually accomplished, by ramming down pounded brick upon the wadding. This closed the hole so thoroughly, that commonly, the brick would remain undisturbed by the explosion, which, of course, spent itself upon the rock, and tore it asunder.

In blasting logs, also, the same object was attained, by driving a wooden pin into the hole above the wadding; and here again the pin often remained in its place, after the explosion which burst the log.

3. But, *in blasting rocks, painful experience has shown, that great danger of premature explosion is encountered, whenever firm substances are made use of to close the canal above the powder;* and multitudes have been killed outright, or dreadfully mutilated by these casualties.

4. *The ingenious remedy, first proposed by the French, and employed, if I mistake not, by the engineers of Napoleon, in constructing his famous roads through the Alps, removed the danger of explosion, but was not in every case effectual.*—As the success is not universal, and the reason and remedy were unknown to the workmen, this method seems not to have been generally adopted in this country. Mr. Blake has, however, given us the rule, by which the desired effect may be rendered certain, and there can be no hesitation in applying it, as is indicated by him, when the hole is bored to a certain depth.

5. *The method of Mr. Blake combines all the advantages of the French mode, with another important one, which is peculiar to his contrivance.*—It is equally safe with the French method, (both are perfectly safe,) and Mr. Blake's supplies the only deficiency in the French mode. The latter was effectual, evidently, because the resistance afforded by the column of sand, when of a certain depth, was sufficient to produce the necessary reaction upon the rock; perhaps the movement which would be given to the sand, by the first expansive lift, when the powder was kindled, would even facilitate its thorough and sudden inflammation, by giving room to the flame to dart at once, into, and among the grains; while the pressure would force the flame to pervade, instantaneously, the whole magazine.

In Mr. Blake's mode, this advantage is equally attained, and when the wooden stopper begins to rise, in consequence of the expansive effort of the gases, it is immediately wedged by the sand, which is crowded between it and the walls of the cavity; more sand presses down from above, and thus a firm resistance is created, by the very effort which the explosion makes to overcome it. It is a peculiar species of valve, which operates at the moment when it is wanted, and not before. It appears to me to combine, in a sufficient degree, all the advantages of the early, effectual, but dangerous mode of ramming in brick fragments; of the other more recent use of gypsum, and other soft substances, and of the filling with sand. Should the experience of the quarrymen confirm the *certainty* of the method, *its safety* being perfect, this new mode of blasting will prove to that dangerous branch of the arts, what the safety lamp has already proved to the coal miners.

Should any practical difficulties occur, such as are frequent in new undertakings, however promising, it is to be hoped that the attempt will not be precipitately abandoned, as it is highly probable that the united efforts of science and mechanical skill will overcome them.

6. *A few remarks on the theory of these accidental explosions*, and I shall have done. To any one acquainted with chemistry, it will not appear very extraordinary, if we reason from the nature of the elements concerned, that there should be cases in which gunpowder explodes without a red heat.

Gunpowder consists of highly inflammable bodies, charcoal and

sulphur, most intimately blended with three times their weight of nitre. Nitre contains more than half its weight of nitric acid, and nearly four-fifths of this is oxygen. Oxygen is the great agent in combustion, and it is rather wonderful than otherwise, that it should lie in close union with dry inflammables, without acting upon them; it is the tiger, reposing peacefully with his prey, and attacking it only when he is roused: the proper stimulus to bring on the action in gunpowder, is a red heat, but it is clearly possible, that much smaller degrees of heat may answer the same purpose, and such degrees are often rendered sensible, by mechanical action. Chemistry abounds with similar cases. If, as has been repeatedly done, chlorate of potash be substituted for nitre, in the composition of gunpowder, no well informed man would dare to ram down a cartridge made of it, much less to charge a rock with it in the ordinary way; it would inevitably explode, by a very gentle pressure; as was fatally experienced at Essone, in France, where, during the trituration of a gunpowder, of this description, although it was conducted with all possible care, an explosion killed several persons.

Fulminating mercury, and fulminating silver, are still more irritable, and the latter, when thoroughly dry, will not permit even the weight of a knife blade to rest upon it, without inducing a violent explosion; in a quantity equal to a common musket charge of gunpowder, it would, probably, be always fatal.*

7. It is not, therefore, theoretically improbable, that the heat necessary to the action of the oxygen upon the combustibles in gunpowder, may be evolved by pressure, and the particles may also be brought within the distance of effectual attraction, by the blow applied in ramming down, and thus it is possible, that the action may come on, even when there is no spark.† May not some of the premature explosions of cannon and other fire arms be attributed to similar causes, especially when the piece is hot, in consequence of previous firing, although there should be no spark?

All these views conspire to render it highly desirable that Mr. Blake's method should prove successful, and I shall be much interested to learn the result, which, after sufficient experience, I shall hope that you will communicate to the public. I remain, respectfully, your very obedient servant, B. Silliman.

[*Silliman's Journal.*

On the Economy of using Alcohol, Ether, &c. in the working of the Steam Engine. By Mr. Ainger.

Mr. Ainger, in a notice on the "Economy of the Steam Engine," made to the Royal Institution of Great Britain, at their meeting,

* I had nearly lost both my eyes in 1811, by the explosion of fulminating silver, which took place in consequence of gentle pressure, even when it was under fluids. The particulars of the accident are related in Dr. Bruce's Journal, vol. 1.

† As in the cases that occurred in France, and which had been cited by Mr. Blake.

February 19, 1830, alluded to the misapprehensions which had at various times existed, as to the saving of fuel which would result from substituting ether or alcohol for water, as the vaporizable material; and he endeavoured to show, that a very simple calculation applied to the known facts, in regard to those substances and their vapours, would have prevented those misapprehensions, and would, indeed, have furnished the same results as have been obtained from experiment. The reasons usually assigned for proposing to use these liquids instead of water, have been the lower temperature at which they assume the state of vapour of a given elastic force (alcohol, for instance, boiling at about 170°, and ether at about 100°;) and also the smaller latent heat of their vapours, as compared with steam. The boiling point of a liquid, and the latent heat of its vapour, form, however, only a small part of the consideration required for calculating its economy. The cost of a certain quantity of force derived from a given bulk of liquid, depends on the boiling temperature, the specific gravity, and the specific heat of the liquid, and, on the latent heat, the actual weight, and the specific gravity of the vapour. These being known, the relative costs of a certain quantity of power derived from two or more liquids may easily be deduced, as in the following comparison between water, alcohol, and ether.

It may be assumed, that these substances are all supplied to the engineer at the same temperature, say 50°. To raise them to their boiling points, they will require the following additions:

	Boiling Point.
Water - -	$212 - 50 = 162$
Alcohol -	$170 - 50 = 120$
Ether - -	$100 - 50 = 50$

Multiply these numbers by the specific gravities of the liquids, respectively.

	Specific Gravity.	
$162 \times$	$1000 =$	$162{,}000$
$120 \times$	$800 =$	$96{,}000$
$50 \times$	$740 =$	$37{,}000$

These results would require to be multiplied by the specific heats of the three liquids; but, as the specific heats are not very perfectly ascertained, and, as far as they are known, do not appear to differ very considerably; and, further, as the cost of heating the liquid forms a small part of the whole expense, the specific heats may be safely neglected, leaving the numbers, 162, 96, and 37, to represent the expense of elevating to the boiling temperature equal volumes of water, alcohol, and ether.

The cost of vaporizing them will be given by multiplying the actual weights (represented by their specific gravities) of the three liquids by their latent heats, which are about 1000, 450, and 300.

	Weight.	Latent Heat.	
Water -	$1000 \times$	$1000 =$	1000
Alcohol -	$800 \times$	$450 =$	360
Ether -	$740 \times$	$300 =$	222

Add these numbers to those representing the cost of heating up to the boiling points, respectively:

$$162 + 1000 = 1162 \text{ Water}$$
$$96 + 360 = 456 \text{ Alcohol}$$
$$37 + 222 = 259 \text{ Ether}$$

then the last results will express the whole cost of vaporizing equal bulks of the liquids in question; the advantage, so far, appearing greatly in favour of the ether and alcohol, as compared with water. But it is now necessary to introduce another element into the calculation, namely, the specific gravity of the vapour, or the volumes of vapour produced from equal volumes of liquid. These are nearly as the following numbers:

Water - - -	1700
Alcohol - -	610
Ether - - -	300

That is to say, one cubic inch of water becomes about 1700 inches of steam, at atmospheric pressure; and single cubical inches of alcohol and ether become 610 and 300 inches, at the same pressure. The quantity of power is obviously as the bulk of the vapour, and the cost is, of consequence, inversely as that bulk. If, therefore, the cost of vaporizing be divided by the bulks of vapour respectively, the quotients will represent the relative expense of equal units of power derived from the three liquids.

$$1162 \div 1700 = .6714 \text{ Water.}$$
$$456 \div 610 = .7475 \text{ Alcohol.}$$
$$259 \div 300 = .8633 \text{ Ether.}$$

From which it appears, that, independently of the original cost of the liquid, supposing indeed that alcohol and ether were supplied spontaneously, as accessible, and at the same temperature as water, even then, water would be the most economical source of power.

From this it appears, that the temperature at which a liquid vaporizes, and the quantity of latent heat absorbed in the process, form no criterion of its eligibility for the production of mechanical force; and that, therefore, there is no reason at present to expect that power can be obtained from liquid carbonic acid gas, or any other of the gases liquefied by Mr. Faraday, more cheaply than from water, merely because of the low temperatures at which they become highly elastic. Analogy, it is evident, would lead to a conclusion exactly the reverse, and would induce an expectation that the vapour of mercury, or even of metals vaporizing at a much higher temperature, would furnish the most economical motive power.

Mr. Ainger then described a mode of increasing almost indefinitely the power, or, in other words, of decreasing almost indefinitely the expense of the steam engine, which has not hitherto been suggested, and which appears to require for its realization, only the discovery of a succession of liquids, whose boiling points should differ about 100° of Fahrenheit; whose nature should not alter by repeated distillation; and which should exert no injurious action on the substances composing the machinery of the steam engine. The difficulty of finding such a series of liquids is probably insuperable; if it were not so, there can be little doubt that the cost of steam power would be susceptible of an immense reduction. If, for instance, a suc-

cession of liquids could be obtained, whose boiling points were 612°, 512°, 412°, 312°, and 212°, and if the furnace were applied to the first, and its vapour were employed to work a condensing engine, it is clear that the vapour which was condensed at 612°, could be made to evaporate the second liquid, by condensing the first on the surface of the vessel containing the second, the vapour of which would, in its turn, work a steam engine. The condensation of the second vapour at 512° might, in like manner, evaporate the third liquid which boils at 412°, and so on, till the water which boils at 212° was evaporated, and which might be condensed by injection in the usual way.

It may perhaps be thought that a cooling surface at 512° will not sufficiently reduce the tension of a vapour at 612°, to leave any effectual difference between the pressures on the two sides of the piston; but it must be recollected, that a depression of 100° reduces the elastic force of a vapour produced at 612°, as much as of one produced at 212°. The elastic force of common steam at 112° is equal only to $2\frac{1}{2}$ inches of mercury; the elastic force, therefore, of the vapour produced at 612° would, when cooled to 512°, be also equal only to $2\frac{1}{2}$ inches of mercury. There is, it must be confessed, a difficulty in condensing by mere contact with a metallic surface, as compared with condensation by an injection: but this difficulty would, in the proposed case, be much less than in the various schemes which have been projected to use alcohol, ether, and liquid carbonic acid, because in the former it is proposed to cool a less easily vaporized substance by one more easily vaporized; whereas, in the latter cases, water, which has been the intended cooling material, is less easily vaporized than the substances it is required to cool; a circumstance obviously unfavourable to the production of the effect. But for this difficulty, it is probable that the heat employed to vaporize water might, by the condensation of the steam, be transferred to alcohol, and from this again to the ether; but the question then arises, how is the heat to be abstracted from the ether; we have no other means than the contact of a vessel containing cold water, a means which is found insufficient for cooling common steam, and which would, therefore, be doubly inefficient in cooling the vapour of ether. These considerations will suggest other difficulties in the construction of engines to use alcohol and ether, beyond the absolute defect of economy, which has been before explained.

[*Brande's Quarterly Journal.*

On the Formation of Steel by means of Silica.

It is well known to chemists, that silicum combines freely with iron, and also, that certain persons have considered silica a substance which possesses in common with carbon, and perhaps boron, the power of converting iron into steel. M. Boussangault, if we mistake not, put forth some views, in which he considered silicon as the constant agent in the production of steel.

The Editor of the *Recueil Industriel* has described several cases, in which the presence of silicon appears to have an important influence of this kind. Some time since, Dr. Eynard of Lyons, having put some files into a mixture of five parts of water with one of sulphuric acid, was astonished when he took them out, to find, at the bottom of the glass vessel in which they had been placed, a grayish white and glairy substance. This, being collected and dried, proved to be silica.

In 1732, MM. Perru of Neufchatel established a manufactory of steel cylinders at Lyons. These cylinders, which were highly polished, and so hard as to be untouched by the file, had been fused, it is said, with *silica*. They have never been imitated. A pair of these cylinders, 5 inches in diameter, sell at this time for 2400 francs.

Some years since, a person of the name of Ranquet, of Lyons, formed vessels of white cast iron of extreme hardness. M. Culhot manufactured cylinders from the fragments of these vessels, and the cylinders were of such hardness, it was impossible to shape them by cutting instruments, so that they could be worked only by emery, and similar substances, occupying months for the purpose. This person made a secret of his process, but it is said, used no charcoal in his process.

M. Eynard found silica in cast iron, but not in forged iron; its occurrence in the former, or rather the presence of silicon, is a well known circumstance.

Upon these facts, the Editor founds some earnest recommendations to those who have the opportunity of ascertaining whether the cementation of iron without charcoal, but with silica alone, would produce steel, and in what proportions the silica ought to be mixed, to obtain a very perfect and hard steel; there are also other points urged, which are either already upon the minds of metallurgists, or are naturally suggested by the two above.

[*New Edin. Philos. Journ.*

Copal Varnish. By J. J. Berzelius.

Copal reduced to coarse powder, and watered with caustic liquid ammonia, swells, and is converted into a gelatinous mass, which is entirely soluble in alcohol. To effect this solution, which makes a very beautiful varnish, liquid ammonia is to be added, by degrees, to pulverized copal, till the swelling ceases, and it becomes a clear and consistent mass. It is then heated to 35° cent., and introduced in small portions at a time, to alcohol of 8, having a temperature of about 5° cent., shaking it well after each addition. A solution is thus obtained, which, after depositing an insignificant portion of sediment, is absolutely colourless, and as clear as water.

[*Journ. de Con. Usuelles, Oct.* 1828.

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

AUGUST, 1830.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN MAY, 1830.

With Remarks and Exemplifications, by the Editor.

1. For *Sundry Machines for the purpose of Checking, or Retarding, the velocity of Road Wagons*, stages, and other wheeled carriages, denominated "Jones' Wagon Lock;" Samuel Jones, Bridgeport, Fayette county, Pennsylvania, May 4.

An elaborate description of eleven pages introduces us to an acquaintance with this invention, or rather these inventions, which consist of different modes of accomplishing the same object.

A friction bar is to be made to press against the front part of the hind wheels of the wagon or carriage; this friction bar is to exceed in length the distance between the wheels; such a bar it is particularly stated, has been long in use, but the present patentee claims as new the application of *friction blocks* upon the friction bar. A dovetailed notch is to be cut into the bar, opposite to each wheel, and blocks of wood are fitted into these notches; the blocks being wedge shaped, are readily knocked out and replaced, as they wear away. It is proposed to face some of these blocks with iron.

Divers modes are proposed of causing the friction blocks to bear against the wheels, as will be perceived by the subjoined claim, which must complete our account of this invention.

"What I claim as new, and as my own invention, or discovery, in the above described machines, and for which I ask an exclusive privilege, is as well the improvement of the dovetailed and wedge

shaped notches in the friction bar, and of the temporary blocks of wood, &c. to be applied to the wheels of road wagons, stages, &c. as herein specified, and the machines, or methods of applying the friction bar with the blocks, as herein described, and before claimed to be my invention, under the heads of No. 1, 2, 3 and 4; all involving the same principle of the hand lever; No. 5, involving the principle of the screw and crank; No. 6, involving beside the hand lever, and the crank, the pinion and rack; and No. 7, involving the principle of the wedge; as also the main general principle which is involved in all of them, of the manual application, and maintainance at pleasure, of a sufficient, regular and determinate friction, against the wheels of the wagon, carriage, &c. through the means of the mechanical powers: and which may be performed with ease and expedition, without stopping the horses to apply it."

---

2. For a *Perpetual Calender;* John O'Hara, Philadelphia, as assignee of the inventor, John L. Dagg, Philadelphia, Pennsylvania, May 4.

This calender may be formed upon a flat surface, in a manner similar to such as have been previously patented, but Mr. O'Hara, the assignee of the inventor, attaches it to an ever-pointed pencil case, in the manner in which the days of the month have heretofore been attached. By its aid the day of the week on which any event happened, may be found with very great facility, the date being given. The arrangement is neat and simple, and if it is not a thing of very great utility, it is calculated to resolve inquiries which are frequently interesting. The particular arrangement of the words and figures would require a diagram for their explanation; we refer the curious, therefore, to the article itself, which, whilst it may satisfy them, will serve the manufacturer, and encourage the arts.

---

3. For an improvement in that part of the *Ingrain Carpet Loom,* which is called the engine; Josiah R. Clark, South Coventry, Tolland county, Connecticut, May 7.

(See specification.)

---

4. For an improvement in the machine for *Cleaning or Preparing of Paddy, or Rough Rice,* for culinary purposes; John L. Norton, of the City of New York, at present residing in Charleston, South Carolina, May 7.

(See specification.)

---

5. For a *Thrashing Machine;* Noah Lindsey, Catskill, Greene county, New York, May 7.

A feeding apron on rollers, a cylindrical beater, a hollow segment equal to about $\frac{1}{4}$ of a circle, containing rollers extending its whole length, and several other parts, are exactly like those repeatedly ap-

plied in thrashing machines. The segment is to be sustained by an elastic thrashing floor, consisting of slats of wood which extend along under the feeding apron, to a distance from the beaters, and are there secured.

"The subscriber claims the sole privilege of applying to this machine, his spring bed, or thrashing floor, which yields to the cylinder, as a thicker or heavier substance passes in; as stones, &c. This spring bed, or thrashing floor, as before mentioned, is formed by the rollers with their supports attached to springs, which by means of the keys before mentioned may be set at any distance from the cylinder, or as near to it as may be necessary; thus constituting the most important part of this improvement."

The concave segment has been sustained by springs in most of the patented thrashing machines; the present plan is merely one of those variations which may be made in machines in general, whilst the principle of action remains unaltered; such a variation, it is true, is sometimes a very important improvement; we shall be glad to hear that the present may prove to be so.

---

6. For a *Machine for Cutting Grass, Grain, &c.;* Erastus Ingersoll, Farmington, Oakland county, Michigan Territory, May 7.

Runners, bearing some resemblance to those of a sleigh, are framed together. A roller, extending across from one of these to the other, at the back part, rests upon the ground, and revolves when the machine is drawn forward. Two pieces, serving as shafts, extend forward, being secured by proper framing. The mowing, or cutting part, is a horizontal wheel, about 8 feet in diameter, running near to the ground, its lower gudgeon fitted in a piece framed across the runners, and its upper in one of the shaft pieces. A band from the roller, extends to a whirl on the axis of this cutting wheel, to give it motion. The cutters are knives fitted on to the periphery of the wheel, so as to form a complete circle; the claim is to "the before described machine for cutting grass, grain, &c."

We recollect a model of a similar machine in the patent office, of long standing, but independently of this, we apprehend that there are few grounds over which a horizontal cutting wheel of eight feet in diameter can be drawn with advantage. Will not such a wheel be obstructed by heavy grass and grain? and will the friction of the roller on the ground be always sufficient to give it motion?

---

7. For an improved *Cooking Stove;* John Moore, Acworth, Sullivan county, New Hampshire, May 7.

This is an oval stove, having the general form of the common ten plate stove. There is nothing in it meriting particular notice, as it merely differs in the form and arrangement of its parts from a number of others; the only things claimed are "two flues which admit the heat under the two upper boilers."

8. For an improvement in the *Spindles used in Spinning, and in the Throstle Frame;* Benjamin Brundred, Oldham, Bergen county, New Jersey, May 7.

Three different modes of constructing spindles are described, and claimed as new; the description is very clearly given, by the aid of a well executed drawing. They are all fixed, or still spindles. In the first, a brass tube is fitted upon the spindle, extending down to the bobbin lifter, and upwards about two-thirds of the length of the spindle. On the lower part of this tube is a whirl by which it is turned, and on the upper part the bobbin is fitted. The upper end of the spindle is hollow, being drilled down to the depth of two or three inches; a small spindle fits and turns in this drilled hole, having flyers attached to its upper end. The operation of this spindle need not be described to those who are familiar with such machinery. The two others are different modifications of this spindle, which are ingenious, but more complex than the former.

The improvement in the throstle frame consists in extending arched pieces from the extreme supports of the frame, to sustain it on the floor, instead of the many legs upon which it usually stands, subjecting the machine to derangement from the sinking of the floor in any part.

The claims are to the various modes of constructing the spindles, and to the arched supports of the throstle frame.

---

9. For an improvement in the manner of *Crimping Boot Fronts;* Joseph H. Punchard, Boston, Massachusetts, May 8.

Boot crimpers have of late held a conspicuous place among the patents issued. That which is the subject of the present patent bears a strong resemblance to one patented by Mr. Dunbar, (page 299 of our last volume;) it, however, is less complex, and has the *form* fixed, and the jaws of the crimper moveable, whilst the reverse is the case in Mr. Dunbar's.

We cannot enter into all the minutia of this contrivance, but from the following quotation, must leave the craft to form the best judgment they can respecting it.

"In using said machine after preparing the leather in the usual way, I apply the boot front on the top of the stationary form, in the usual way, and smooth it down a little with the hands; I then bring over the arms, or lever, with a smart pressure, and force it over the form, quite clear of the boot front; one operation is sufficient to crimp it thoroughly, and prepare it for the common moveable form; the arms, or lever, being pressed quite clear of the boot front, the work is removed with the greatest possible ease."

"The mechanical improvement upon which I particularly rely, and for which I claim the protection of letters patent, is the fixing of the board, or form, on which the boot fronts are spread, and forcing the arms, or lever, upon them in this situation, to be crimped; whereby the work is wholly in sight, and produced more perfectly, in less time, and infinitely less labour, than in any other mode."

10. For an improvement in the mode of *Dressing Staves;* Charles B. Goodrich, Rutland, Worcester county, Massachusetts, May 10.

This is an ingeniously constructed, well arranged, and, we apprehend, a successfully operating machine. The description and drawings are every thing that can be desired.

Both sides of the stave are operated upon at the same time, one being cut concave, and the other convex. The operating part of the machine to which the cutters are fixed, are somewhat in the form of the letter D, there being pivots upon which it turns placed in the middle of the straight side, this being the centre of the circular part. The circular part is double, consisting of two circular rims, or felloes, the outer rim having planes, or cutters, on the inside, or concave part, and the inner one cutters on the outside, or convex part; between these the stave is to be passed. A vibratory motion is given to the segment; as it comes down the cutting is effected, and as it rises the stave is advanced, until it has passed entirely through.

The claim is to "the application of the planes to the felloes, and to the motion of the felloes backward and forward in part of a circle, dressing the stave on both sides at the same time."

---

11. For an improved *Portable Cooking Furnace;* Asael Cross, Cazenovia, Madison county, New York, May 12.

This furnace is to be twelve and a half inches square, and the same in height; it is to be formed of cast iron plates put together. There is to be a fire place, grate, and ash pit below, and an oven above the fire; a space is to be left on each side of the oven for a draft. There is to be a second grate above, upon which also fire may be placed. Cast rims, with openings of various sizes, adapted to vessels of different kinds, may be placed over the upper fire. The purchaser may light it at both ends, or not, as he pleases.

We are informed that "the improvements consist, *first*, in the furnace being *square*, instead of round. *Second*, in the construction of the *oven* in the centre, and being stationary, and throwing the heat all around it; and *lastly*, in the grate and rims at the top, with the great increase of draft and heat."

The *claim* to making a furnace square, may certainly be new, although square furnaces are old enough. The second claim we do not understand, as regards the *stationary* part. Rims to enlarge or contract the opening at the top of a furnace were known to our fathers. The great increase of draft and heat, is not, we apprehend, a part of the furnace, and is rather a strange kind of patentable article.

---

12. For a *Thrashing Machine;* Samuel S. Allen, Springport, Cayuga county, New York. Patent first issued November 1st, 1828. Surrendered and cancelled for the purpose of correcting the specification, and reissued May 13th, 1830.

The original machine is noticed at page 117, vol. iii. new series;

the present description does not differ essentially from the former, to which reference may, therefore, be had.

---

13. For a machine to facilitate the *Napping of Hats;* A. P. Gregory, Ithaca, Tompkins county, New York, May 13.
(See specification.)

---

14. For an improved *Nail Machine*, called the "Reed Machine;" Joseph Hearsey, Wareham, Plymouth county, Massachusetts, May 13.

The intention of this machine is to gripe the nail flatwise, when it is headed. The machine is described generally, without clearly distinguishing what is new. We presume that by calling it the Reed Machine, it is intended to patent an improvement upon that machine. There is no claim, but we are told that "the Reed Machine is rendered capable of griping the nail flatwise when it is headed, and more flat-griped nails can now be made on said machine, in the same time, than on any other machine heretofore invented."

---

15. For the *Combination of a Cooking Apparatus, with a Hot Air Furnace;* Joseph Jennings, City of New York, May 14.

The petition states that by this combination, the patentee "can not only perform all that is required for culinary purposes, such as roasting, boiling, baking, frying, broiling, stewing, &c. but also heating every apartment in the house to any agreeable temperature, by conducting the hot air through pipes, or flues, which has not heretofore been used or known."

The specification is in the following words. "I prefer the cooking apparatus set over the furnace, as described in the drawing deposited in the patent office; but it may be placed at the side, or otherwise. The furnace may be of iron, brick, or any other material that may be preferred. The one referred to in the drawing is of cast iron. Any fuel will do, but I prefer anthracite coal. The above is a full and exact description of my said invention.

JOSEPH JENNINGS."

The drawing shows a cylindrical furnace, with bars in front, and is surrounded with brick work, all but the bars, leaving a hot air chamber all around. Above the furnace is an oven of sheet or cast iron, with a space around it leading to the smoke flue. From the hot air chamber flues are to be conducted wherever heat is wanted. Two flues, or openings, are made from the room, into the hot air flue, to supply it with cold atmospheric air.

In a note appended to the description, we are informed that "the hot air is let into the different rooms in the upper part of the house by means of apertures in the surbase of each room."

This description is certainly very meager, and we are uninformed in what the novelty consists, and how to conduct all the gastronomic operations to be performed. We think it bad management to

supply air from the kitchen, at all events in winter, when all the rooms require to be warmed. If the hot air flues have "not heretofore been known" to the patentee, he has lived out of the atmosphere of stove constructors, and heat distributors.

---

16. For a *Thrashing Machine;* James Douglass and Walter Johnson, Attica, Genesee county, New York, May 14.

The beater is to be set with teeth, and the concave segment is likewise to have teeth on it. It is in fact altogether like Mr. Allen's, No. 12, excepting in the making the concave in separate pieces, as in this it is to be of one piece of cast iron.

The only thing which seems to be claimed is the making of some parts of the machine of cast, and others of wrought iron.

---

17. For an improvement in the *Manufacture of Pasteboard, Band-box Paper, Bookbinders' Boards*, and all other kinds of brown paper; Isaac Sanderson, Milton, Norfolk county, Massachusetts, May 15.

This patent is taken for manufacturing the above named articles from salt meadow grass, of various kinds, first made into hay, and prepared by using lime water, potash, and train or spermaceti oil. The patentee does not, however, claim either the use, or the mode of using the foregoing articles, and says, "but what is claimed as a new invention, or discovery, by me, is the making of brown paper entirely, or chiefly, from salt hay boiled and prepared as aforesaid."

---

18. For improvements on the *Piano Forte;* Charles P. Sakmeister, City of New York, May 17.

The improvements consist in "a *back catch*, applicable to the old action, (called the English action,) also in the construction and movement of the *hammer shank*, and a *front catch.*"

"The back catch is intended to prevent the hammer from vibrating, or rebounding back to the strings."

The action of the hammer, and indeed of all the parts, would require a drawing to make them clearly known; they are very well represented in that accompanying the specification. The claims are,

"*First.* The lever upon which is placed the back catch, placing the catch thereon, and the method of operating upon it."

"*Secondly.* The lever upon which is placed the front catch; the manner in which the front catch is made to act upon the hammer, by means of the lever aforesaid."

"*Thirdly.* The form of the hammer shank, or that part of it which is acted upon by the jack."

---

19. For a new mode of *Using Horse Power by means of an endless Chain and Rail-way*, called "the Endless Chain and Rail-way Horse Power;" Samuel Lane, Hallowell, Kennebeck county, Maine, May 17.

Horses walking upon inclined floors, the pieces of which are linked together and form an endless chain, or floor, is a well known means of applying animal power; motion being communicated to machinery by one of the drums over which the endless floor passes. The floors are usually made of strips of wood, which, by the treading of the horse, soon wear down, and become so elastic as to consume much of the power applied to them. The mode in which they are sustained is also, in general, very defective. We think this invention of Mr. Lane a real improvement upon this apparatus; we are also informed that it has answered perfectly well in practice, and have no doubt of the correctness of the information.

The floor instead of being made of wood, is formed of round bar iron of seven-eighths of an inch in diameter, and twenty inches in length. The rods are placed about seven-eighths of an inch apart, which leaves the proper space for the cork of the horse's shoe. The iron rods are turned down to five-eighths of an inch at each end, and receive a true cast iron roller, to serve as a friction roller, leaving beyond this, sufficient length of the turned down part to serve as a gudgeon to couple the rods together, which is done by flat links of iron, forming an endless chain at each side; the outer ends of these gudgeons drop into notches on the head of one of the drums, to prevent slipping. A wooden rail, faced with iron, is placed under the rollers, at each side, and form a rail-way upon which they run.

The claim is to this mode of forming the floor of iron rods, and the attaching the rollers in the way described, to run upon the railway, with the mode of connecting them.

---

20. For an improvement in the *Bedstead as inclosed within, or attached to Presses, Bureaus, Sofas,* &c. denominated the "Secret Bedstead;" Williams Wooley, City of New York, May 17.

The bedstead above named is made to fold up in a manner which resembles the leaves of a common dining table, supposing the table inverted. The sacking bottom is fastened to two strips which drop into notches, or mortises, in the frame. The bottom part of the bedstead is upon castors, or rollers, upon which it is run out of the press when the doors are opened. Two levers, one at each end of the press, connect the bedstead and press together, one end being attached to the press, and the other to the bedstead, by pins, so as to form a joint.

The specification does not state in what the improvement consists, but merely describes the whole bedstead, without any claim: if the patent can be sustained, therefore, it must be limited to the particular arrangement of the parts as specified.

---

21. For the construction of a *Vessel to be Propelled by Steam,* called the "Fin Steam Vessel;" Antoine Batby, City of New York, May 18.

This boat is to be propelled by buckets, or fins, which work en-

tirely under the water. There is on each side of the keel a slider working in grooves, to which the buckets, or fins, are attached, like hinged shutters, they being intended to close and open, as the slider passes alternately backwards and forwards. The sliders may be each twenty feet long; the grooves in which they slide, forty, in order to allow them to have a stroke of twenty feet. To each of the slides a rack is attached, which being operated upon by a wheel working through a water-tight casing, leaving an opening from the deck to the bottom of the vessel, is moved alternately backward and forward, twenty feet; its gearing with the piston of the steam engine producing this motion. The cylinder, we presume, lies horizontally on the deck, and its piston rod is a rack, which takes into a pinion upon a shaft, carrying two large toothed wheels, driving those which operate upon the racks of the sliders.

The buckets, or fins, are each eight feet long, and four feet wide, at the widest part; they are made fin-shaped, which, if we understand the description correctly, reduces them to 19 square feet of surface each. The patentee says he borrowed the idea of the *form* of the propellers from the fins of fishes; this, however, is a fancied analogy, as the fins of fishes are not propellers, but rudders, the fish swimming by the sculling motion of the tail. If his propellers are good in any form, they would be better left square, than rounded off.

The fins, it appears, are to hang loosely, and to be opened and closed by the action of the water.

The claim is to "the fins, the sliders, their casements, and the part of the machinery used to connect the sliders with the piston rod of the steam engine."

We do not see in what respect this alternating motion of the paddles is to surpass in effect the many attempts which have been made to obtain a continued direct motion by endless chains, to which the paddles have been attached. The amount which will be lost in the friction of the racks and pinions, and the resistance of the slides and their appendages in the return stroke, will abstract greatly from the effect of the power applied, and, we have no doubt, will reduce the value of this mode of propelling below that of the ordinary wheel.

---

22. For a *Thrashing Machine;* Samuel Fisher and David Sperry, Botetourt county, Virginia, May 19.

A cylinder with beaters, and teeth, and a concave with corresponding teeth, form the essential parts of this *new* thrashing machine. The spikes, or teeth, however, are to be fluted on their ends and sides, and this, we are told, is its distinguishing feature, "in consequence of which the grain is beat, and rubbed off, at the same time, with much greater ease than if they were not fluted."

---

23. For an improvement in the *Mode of Applying the Common Flyer for Spinning and Twisting*, denominated the "Universal Spinner;" John Brown, Providence, Rhode Island, May 20.

The spindle in the improved mode proposed, has a bearing at each end, and an aperture at top, for the thread to pass through, similar to that in the common flax wheel spindle. The bobbin has a positive motion given by a whirl at its bottom; the flyer is attached to the upper part of the spindle, and this latter passes through a tube made fast in the waive rail, or lifter, on the throstle frame; it runs quite freely in this tube, being subjected as little as possible to any obstruction, excepting that of the draught of the thread, which is attached to the flyer in the usual way. To regulate the draught with the necessary precision, the lower end of the spindle passes through a notch in a piece of leather, to which a weight may be attached.

"The band which gives motion passes from the cylinder in the frame, to a whirl under the bobbin, on said tube, instead of passing to a whirl on the spindle; neither the whirl nor the bobbin having any connexion with the spindle, excepting in causing the revolution of the flyer and spindle, by the aid of the thread; the flyer being fast is conveniently lifted from its place, with the spindle, for doffing, &c."

There is a fast whirl on the tube, on to which the band may be dropped, and from which it may be raised, by a touch of the finger, when piecing is to be effected.

The claim is to "the peculiar application of the flyer and bobbin, as above."

---

24. For an improvement in the *Art of Distilling Whiskey*, or other spirituous liquors, by steam; William Berkley, Lebanon, Washington county, Kentucky, May 20.

The arrangement of the pipes and tubs in this apparatus, scarcely admit of mere verbal description; the object proposed to be attained is great economy in the operation. The plan is well represented in the drawing, but the description is general, no claim being made, and we cannot, therefore, tell precisely for what the patent is taken.

---

25. For a machine for *Jointing Staves for Barrels, &c.*; Charles B. Goodrich, Rutland, Worcester county, Massachusetts, May 20.

We are ready to employ the same terms in expressing our opinion of this machine, which we used respecting that (No. 10,) invented by the same gentleman for dressing staves.

A knife, or shave, equal in length to the stave to be jointed, is fixed across a frame of wood, made like that of the saw frame in the common saw mill, and worked up and down by a crank and pitman in the same way. The shave is to be made about three-eighths of an inch thick, and two inches wide; it is not straight on its cutting edge, the middle part being the lowest, and the edges rising each way, so as to give it something of a V shape, the angle, however, being a very obtuse one; the consequence of this, is, that as the shave cuts the edge of the stave, it operates diagonally upon every part of

it. In order to give the bulge to the stave, the face of the knife must be hollow, or concave; it receives this form by being drawn back by a bolt which passes through its centre, and which may be tightened by means of a screw and nut acting upon a block attached to the frame, and behind the knife; any desired curvature may be thus attained.

The stave to be jointed is held down upon a head block, upon a carriage in front of the shave. This head block forms such an angle with the shave, as may be necessary to give the stave the proper cant, according to the size of the intended vessel. The stave is made to advance slowly, that the shave may not cut too rank, but take shavings of a suitable thickness. A small saw, attached to the frame, divides the shavings in the middle as they are cut off, by which means they readily clear themselves.

The claim is to "the application of a shave, or knife, similar in shape to the one above described, to the jointing of staves for bulging casks."

---

26. For a *Fountain Pen, for Writing with;* D. W. Hyde, Reading, Berks county, Pennsylvania. May 20.

Imagine a common old fashioned pencil case, containing a small tube, instead of a black lead pencil; let this tube be open at both ends, the lower end terminating in a point, like a cut pencil, with a slit admitting ink to flow through it. Fill the tube with ink, place a cork in the upper opening, and you have the whole establishment.

Fountain pens have been frequently made, but usually much less *simple* than that now offered. If carried in the pocket, it ought to be in that of a black man, with a black dress, as, in this case, it will produce but little change either in the colour of the skin or of the clothes. Whenever the tube is warmed, the expansion of the air will force the ink out; and when it is cooled, the ink will retire from the point, and refuse to run.

The claim to "*invention*, is the before described fountain pen."

---

27. For an improvement in the *Production of Artificial Light*, in the burning of tallow, oil, or other fatty substances; Isaiah Jennings, City of New York, May 20.

(See specification.)

---

28. For machines for *Breaking and Dressing Hemp and Flax;* John Rich, jr. Troy, New York, May 20.

Two fluted rollers standing horizontally are placed as near as may be to each other, a third roller stands centrically over the two, and meshes into each of them. The gudgeons of this third roller are placed in weighted blocks, which have a vertical motion. The flax, &c. to be broken is passed backwards and forwards, between these rollers, until it is sufficiently broken. For this purpose the lower rollers have toothed wheels upon their ends. A rack, worked

backwards and forwards by a crank and pitman, or otherwise, takes into these teeth; the vibration is to be to such extent as shall carry the fibres each way, their whole length. As it passes out from the rollers it is received at each side upon endless aprons, which sustain it, and have the same vibratory motion with the flax itself. This is given to them by gearing the inner rollers which support them to the toothed wheels on the breaking rollers.

The endless aprons are formed of narrow slats of wood, properly connected by ropes, straps, or otherwise.

The dressing machine is formed, in part, of an endless apron, placed so as to make an angle of about forty degrees with the horizon; it is composed of slats of wood, like the former; these slats have projecting pins, properly arranged; the material to be dressed is held in, and managed by, the hand; the apron being moved in a descending direction, the pins act upon the fibres.

"The improvements which I specially claim, and which are considered as original in myself, being,

"The principle as well as the manner of effecting the reverberatory, or vibrating motion, and the process of [passing] the hemp and flax through between the breaking rollers, by which it is made to pass backwards and forwards between them, until sufficiently broken, without the necessity of re-handling;—together with the aprons therewith connected, and the motion corresponding with the rollers there given to them."

"Also the whole of the apparatus for dressing and cleaning the hemp and flax of the shives, or woody part; and especially the manner of constructing the revolving aprons, as before described, and using and applying them to common, or other carding machines of wool, or cotton, or wherever revolving aprons are required."

"Together with the machinery as connected with the said improvements, and the principles embraced therein, or whereby like processes, operations, and effects, are to be produced. And generally all such other improvements in this specification mentioned, and not thus specially designated, as are original in themselves, or become so by reason of the particular application or combination therein given to them, and which shall be found not to interfere with any improvements heretofore known or used."

With the exception of the claims, we have given a very condensed epitome of the description of this machinery. The specification is written with much ability, giving a full, and remarkably clear description of the whole. The claims also, so far as they are contained in the two first paragraphs, are very distinctly made; those in the last we view as altogether redundant; we do not suppose that there is any thing contained in them calculated to vitiate a patent, but that, in a court of law, they would be considered as mere surplussage. If any thing can be claimed in a manner so vague, every thing may, and the part which precedes it would be useless. It is the business of the patentee to tell distinctly what he patents, and not to say that there is, or may be something else which is new, and which he has invented without knowing it, and should any one find out what this

is, he is hereby forewarned not to use it. Upon examining the terms of the law it will be found to exact something very different from this.

---

29. For a "*Double Pendulum Corn Mill;*" M. B. Poitiaud, Richmond, Virginia, May 20.

We might very well place this invention among our *Modern Antiques*, for although we cannot say that it has been long known and used, we may aver that this "new and useful mode of working wheel machinery," has been long invented, frequently tried, and uniformly abandoned. No scientific machinist would for a moment think of using the pendulum as a motive power, any more than he would of constructing a perpetual motion. Give us the one, and the other is discovered.

Mr. Poitiaud uses the pendulum as a motive power to drive mill stones. The pendulum is to operate upon ratchet wheels placed on the mill stone shaft; their operation is to be such as shall propel it in the same direction by the backward and forward vibration; this kind of motion is well known to mechanicians, and need not be described. There is also a fly wheel upon the shaft, which is not only to regulate, but "add some to the power." Two men are to work the mill stones. The patentee, we are informed, is actually constructing a mill, to manifest the correctness of his principles. We hope the cost of it will not be a consideration of any importance to him, as he certainly will never be remunerated by its profits.

---

30. For an improvement in *Street Pumps*, to prevent persons from throwing stones, or other hard articles into the same; Martin Mettee, Baltimore, Maryland, May 20.

A patent was taken out in September last, by Mr. J. W. Hillias, of Baltimore, with the same view as the above; it is noticed at page 410, vol. iv. new series. The present patentee uses a cast iron box for the gudgeons of his pump handle to work in. The short end of the lever, which is attached to the piston rod, is not in a line with the handle, or long end, and the mortise or slot, in which the handle works, does not, therefore, pass through to the inside of the body of the pump. The nozzle is to be of cast iron, with a flanch, to attach it to the pump by means of screws; it is also to be formed with an elbow, and to have two half diaphragms, or partitions, within it, at a distance from each other, to prevent the introduction of stones, &c. There is no claim.

Most of the pumps in the city of Washington are without a mortise for the handle. The pin upon which it works comes through on one side, and the handle is there attached to it, answering every purpose of the complex contrivance proposed by the patentee. A handle might be made and inserted in the common way, by merely enlarging the part which surrounds the fulcrum, so that it might form a circle of four inches in diameter; it might then be so inserted

into the pump tree, as not to leave any opening into the bore of the pump.

[TO BE CONTINUED.]

Specifications of American Patents.

Specification of a patent for an improvement in the Percussion Lock for Guns, called the "Concealed Percussion Gun Lock." Granted to Joel Newbury, *Poughkeepsie, Dutchess county, New York, April 27th,* 1830.

This improvement, and the manner of using it, are as follows:—

The whole lock consists of a main spring and feather spring, a cocking and discharging trigger, and a sear, or dog, kept in their places by three screws and a pin.

The lock rests upon the trigger plate attached to the guard, and when fixed upon the gun for use, is let into the under side of the stock, by which it is so far concealed as to present the appearance of a common gun with two triggers protected by a guard, but without any lock.

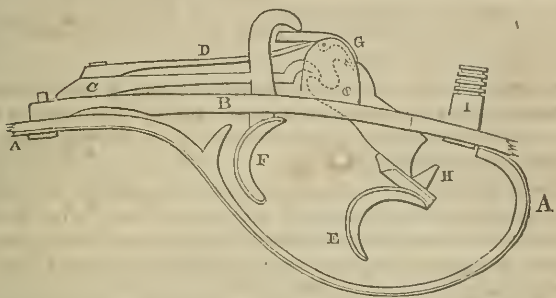
The main spring is immediately above the trigger plate, and the feather spring immediately above that, and both are attached to the trigger plate at the but, or end of the springs nearest the gun breach, by a screw passing through both, which, by screwing tight, stiffens the springs, or, by partially unscrewing, relaxes them; these springs are both protected and kept in place at the forward end by two semicircular flanches attached to the upper edge of the trigger plate. Between the flanches are fastened, by a screw passing through each, the cocking, or forward trigger, and the sear, or dog.

The cocking, or forward trigger, plays through the trigger plate, and its office is to supply the place of the common gun cock, and is operated on by the main spring; the forward end of which plays into the cocking trigger between the flanches in the same manner as the main spring of the common gun lock plays into the tumbler.

When this forward, or cocking trigger, is pulled, the forward end of it comes down towards the bow of the trigger guard, and is set in the same manner and on the same principle as the common gun cock, by the sear, or dog, operated on by the feather spring which presses the forward end or point of the sear, or dog, into a notch or notches made for that purpose in the sear and circular end of the cocking trigger, on its upper edge. At the forward end of the cocking trigger, on its upper side, is to be either a hammer to strike on a percussion cap, or, instead of a hammer, there is to be a bill, or cone, to strike upon a kernel of percussion or fulminating powder, placed in the mouth of a tube passing through the trigger plate, stock and gun barrel, on the under side, and communicating with the charge of powder at the breach pin in the same manner as through the common tube or touch hole. This cocking trigger, which answers to the common gun cock, is unbent or discharged by the dis-

charging trigger, in the same manner, in every respect, as the cock of the common gun lock, by the discharging trigger operating on the sear, or dog, which, by pressure, is disengaged from the notch in the cocking trigger. The cocking trigger may be either within or forward of the trigger guard, or playing through a slit cut for the purpose in the forward part of the guard. The same principle is intended to be applied to pistols and to double barrelled guns.

Joel Newbury.



A, guard. B, trigger plate. C, main spring. D, feather spring. E, cocking trigger. F, discharging trigger. G, sear, or dog. H, bill, or cone. I, tube which screws into the touch hole.

Specification of a patent for an improvement in the art of making Glue, by evaporating the water commonly called the foot water, or the liquor after boiling the bones of all kinds of animals, to a proper consistence for cutting, drying, and making into Glue, by means of a double floored evaporating basin. Granted to Peter Cooper, *City of New York, April 29th,* 1830.

This improvement consists in having an ordinary furnace made of brick work; from this runs a horizontal chimney or flue half the width, and running the whole length, on which it is intended to construct the evaporating basin, it is then returned on the other side back to the furnace where the flue terminates in a perpendicular chimney. Across these two flues are to be laid at proper distances, iron bars of about an inch in breadth, to support the lower basin; upon these is laid one extended sheet of lead, or other metallic substance, and upon the edge of this is placed a wooden curb from six to twelve inches deep. To the outside of this wooden curb the sheet of lead is to be nailed all round, and so as to be water tight.

Upon the bottom of this basin are laid three or four longitudinal strips of boards about two or three inches in width, and terminating about a foot short of the inside of the curb at the end furthermost from the furnace. Across these, and about an inch, or an inch and

a half apart, are slats of about an inch thick, and an inch high, and nailed to the longitudinal strips on which they rest.

At the point where the longitudinal strips terminate, at the far end of the curb, and about one foot from it, is a piece of *board* going across the basin and grooved to the inside of the wooden curb aforesaid, this board is to be constructed about half an inch higher than the surrounding curb, and about two inches less in depth.

Upon these slats is another sheet of lead extended, or other metallic substance, the edge of which is to be bent up, and nailed to the inside of the curb and the board aforesaid, and so as to be impervious to the water.

This completes the construction of the evaporating basin; water is now to be poured in the open end of the lower basin, which is beyond the board aforesaid, until it fills up all the space that is between the two basins. Fire is then put to the furnace until the water boils, and then the foot water or the liquor remaining after boiling the oil from the bones and feet, is to be run into the upper basin, and the fire kept up until the foot water is evaporated to a proper consistence to be taken out and put into cooling troughs, where it afterwards is cut and spread on nets to dry. This completes the process.

The improvement for which your petitioner claims an exclusive right, is the construction of the double floored evaporating basin, and the application of it to the purposes of making glue, described as aforesaid, whereby the foot water, or liquor after boiling the bones of all kinds of animals, is evaporated into a proper consistence to preserve it, and make it into glue. PETER COOPER.

Specification of a patent for an improvement in that part of the Ingrain Carpet Loom, which is called the Engine. Granted to JOSIAH R. CLARK, *South Coventry, Tolland county, Connecticut, May 7th,* 1830.

THIS improvement consists in substituting a rotary sheet of pasteboard, parchment, painted canvass, or any other suitable substance, perforated with holes in such a manner as to form the figure required, in lieu of the barrel or cylinder with wire cogs, or staples, set in it, (somewhat resembling the barrel of a hand organ) which is commonly used; and also as a substitute for, and an improvement on "the Jay Card Machine," so called, or as it is sometimes called, "the Paper Machine;" and also as an improvement on the canvass apron with cogs or strips of wood attached to it, and with staples set in these cogs, which has been recently brought into use. The sheet of pasteboard, &c. required, will be of various size, according to the design of the figure to be laid out upon it, but always of a breadth about equal to the length of the cylinders, or cylinder, around which the sheet is to operate, and on this sheet is to be laid out the design for the figures to be woven by it in the same manner as the surface of the cylinder, or barrel, is usually laid out for the setting of the wire

cogs, or staples; and in every place where a wire cog would be set in the cylinder, punch, or cut, a fair hole through the pasteboard; and all these holes in equi-distant lines across the pasteboard; and besides the holes which are laid out to form the figure, punch other holes near each edge of the pasteboard in about every second or third line of the figure holes. This sheet, being thus prepared, may be conveniently applied and used in the following manner, viz. place a small cylinder of any convenient diameter, and of such length as the work requires, say from twenty-one to thirty-eight inches long, in the same place, or nearly in the same place of the large barrel, or cylinder, commonly used; this small cylinder is to be fluted, or grooved, from end to end, with grooves about half an inch deep, and just as near together as the lines of holes across the pasteboard are; in every second or third groove, near each end of the cylinder, drive a pin of wire having a blunt point rising somewhat above the surface of the cylinder, and standing in right lines around it, like spur cogs, and exactly corresponding with the edge holes in the pasteboard. At a suitable distance behind this fluted cylinder, and parallel to it, place another plain cylinder; around both these cylinders wrap the sheet of pasteboard, and lace, or tack, the two ends together, or as nearly together as may be, in the manner of a rotary apron, or creeper, the rows of holes in the edges of which suit to the rows of pins in the fluted cylinder, and by which it is regularly moved forward and backward, in the same manner, and by similar machinery, to that which is in common use.

In all "pointed," or "gathered" patterns, it is best to move the apron forward for the first half of the figure, and backwards for the reverse half; but in all "sprig," or "cumber" patterns, it is best to move the apron perpetually forward, in the same manner as is known and practised by all carpet weavers.

In the barrel, or cylinder, engine, the pins or staples are so arranged, that the wire slides, commonly called "levers," which govern the threads of the warp, slide towards the cylinder at every "hard," or double throw of the shuttle, and a part of these slides, or levers, meeting with the pins, are obstructed in their course towards the centre of the barrel, and the number thus obstructed determines the number of threads of warp which shall be thrown over the surface of the web, from time to time, as the weaving progresses, to form the figures; and a cylinder, or barrel, with pins differently arranged, is requisite for each differently figured pattern. But this improvement is different, in that the levers, or slides, which meet with the holes through the foster-board, are permitted to pass inward by entering into the grooves in the smaller cylinder, and so determine the number and arrangement of the threads of the warp which shall be thrown upon the surface to constitute the figures.

There are, however, not only several different substances which may answer nearly as well as pasteboard, but also several different arrangements not differing essentially from that more particularly described; especially, that instead of having the perforated apron pass round two cylinders in an elliptical form, as before described,

it may be bound fast upon the surface of a large cylinder, grooved as aforesaid; the grooves being just as far apart as the rows or lines of holes in the apron; but in this arrangement there will be no need of so many holes at the edges as in the former case; and this cylinder may take the same place, and be moved by the same machinery, and in the same manner, as the common barrel with pins in it is moved. In this arrangement, as well as the foregoing, the same cylinder continues always on the engine, and the coverings only are changed to operate all the variety of patterns.

In fine, the only things which I claim as improvements are the rotary apron perforated so as to form the figure (upon principles already in use) as being much cheaper, more simple, more sure to be in order, more easily shifted, and requiring less attention in foremanship, than the barrel with pins, or staples, the canvass with staples, or any other method of forming the figures in carpet engines now in use; and also the fluted, or grooved cylinder, upon which the perforated apron operates. Josiah R. Clark.

Specification of a patent for an improvement in the mode of preparing Paddy, or Rough Rice, suitable for culinary purposes. Granted to John L. Norton, *of the City of New York, at present residing in Charleston, South Carolina, May 7th,* 1830.

The paddy, or rough rice, after having been sifted through a screen of wire cloth to separate it from the defective light rice and dust, or sand, descends, or is conveyed to a pair of mill stones, for the purpose of shelling, or removing the external hull, or shell; from the stone the rice passes a wind fan, to separate the chaff, or outer husk, from the shelled rice, which is next to be conveyed to a screen of wire cloth, of two degrees of fineness, the finest part being at the most elevated end, is adapted to let out the dust, or sand, and the lower, or coarser part, to allow the shelled rice to pass through; and such grains as may have escaped from the stones without being shelled, will not pass through this wire cloth, but be delivered at its lower end to be passed again to the stones. The process so far described, has been known and used for a long period of time, and I distinctly disclaim all exclusive privilege to the use of any part, or parts, of the foregoing process.

But rice has also an internal pellicle, or skin, which, although very thin, requires to be removed before it is fit for culinary use, and which is not effected by the previous operation of the stones or screens. The following is a full and exact description of my improvement.

The internal pellicle, or skin, I rub off, and remove by triturating, or rubbing the shelled rice between a mill stone, commonly called the bed stone, and a runner (made of wood, or other substance,) faced with sheep skin, (with the wool on) or any other elastic substance, which presses the rice close against the bed stone, not so hard as to break the rice, but sufficiently so to cause the grain to be

rubbed with a rapid motion against the stone, which takes off the extraneous substance from most of the grains, leaving the pearly substance of the grain bright and clear; this process is to be repeated, and the quality, or state of the rice, may be such as to require it to be passed through the machine three or more times, and to be screened and fanned between each operation. The rice is then, in the ordinary manner, to pass through screens, or fans, to the spout which delivers it into the barrel.

The application of this invention may be varied by making the runners of stone, and the bed stone, (if I may so call it,) of wood, or other substance, faced with sheep skin, (with the wool on) or any other elastic substance, which will press, and keep the rice in close contact with the stone.

The bed stone and runner, which I have used, are six feet in diameter, and move at the rate of 120 revolutions per minute, though I do not limit myself to any particular dimensions or speed, but I have found these to answer my purpose. JOHN L. NORTON.

Specification of a patent for a machine, denominated the "Facilitator," for the Napping of Hats. Granted to A. P. GREGORY, *Ithaca, Tompkins county, New York, May* 13*th*, 1830.

THE *Facilitator*, or napping machine, is so constructed as to combine all the requisite properties of hand labour in making the nap penetrate the bodies of the hats, which are, *motion*, *pressure*, *heat* and *wet*. The hats are prepared in the usual way, by first sticking on the naps; they are then rolled up singly in the same way that they are rolled to work by hand (omitting the cloth that they are usually rolled in) and put into the machine while wet and hot, the machine standing on the plank kettle, the bottom resting on the rim of the same.

The *Facilitator* is constructed as follows, and may be proportioned in size to the work intended to be done. For a machine which will carry 18 hats, or under, it should be 18 inches square at bottom, and 26 inches in height. The machine from the bottom, up, 13 inches, is divided into two equal parts, by an inch board, which is introduced at the bottom, and secured by nails passing through the sides of the machine, and into the ends of the board. Three inches above the upper edge of this board, which is 16 inches from the bottom, hangs a wooden shaft, ranging with the board below, on an axis one inch in diameter, to one end of which is attached a crank one foot in length. Through this shaft, and two inches from each side of the box, are two arms 17 inches in length; on the ends of the arms are two pieces of wood, one inch square and 15½ inches long; the shaft, arms and pieces on the ends of the arms, forming a frame which may be represented by two parallel lines, 17 inches long and 12 inches apart, for the arms; and at the extremities of these arms, two other parallel lines, 15½ inches long, forming right angles with the two

first lines. Then draw a line across the two longest equi-distant from the ends, which represents the shaft, to one end of which the crank is attached.

When in operation, the crank is moved by a vibrating motion, similar to the pendulum of a clock, with the exception that its vibration is longer, say about 170 degrees, and about as frequent as a time piece which beats half seconds. To the extremities of the arms, on the pieces of wood one inch in diameter, is fastened, by small tacks, a piece of coarse woollen cloth (lion skin) $1\frac{1}{2}$ yards long, and 16 inches wide; the middle resting on the upper edge of the board by which the box is divided into two equal parts, to the edge of which it is fastened by nails, and hanging down into each apartment in the form of bags, into which the hats are put, through a door made for the purpose on the side of the machine opposite to the crank. By giving motion to the crank, the ends of the cloth being attached to the extremities of the arms, gives a rolling motion to the hats, and at every motion the bags with the hats go so low as to touch the water in the kettle, which keeps them sufficiently wet, and the machine confining the steam, keeps them much hotter than they can be worked by hand. It is necessary to take out the hats at the first as often as once in about 4 or 5 minutes to open them, or (to use a hatter's phrase) to crose them, to prevent the naps from running together; but towards the last, they may run twice that time. Hats may be sufficiently scalded in from 1 to $1\frac{1}{2}$ hours, according to the stock used and the number of hats worked at once. When as few as four hats are worked at one time, they should all be put into one side, but when more than 4 are worked, there should be as many put in one side as in the other. The top of the machine forms a half circle, the axis of the shaft being the centre. It is made separate from the bottom part, and attached to it by a pair of buts on the side of the machine opposite to the crank, and a small hook with two dowels on the side of the crank.

A. P. GREGORY.

Fig. 1.

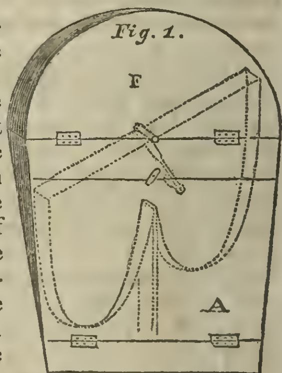
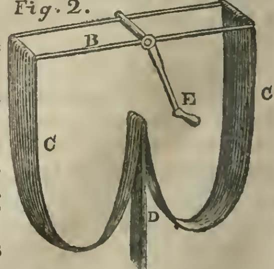


Fig. 2.



A, (Fig. 1,) tight wooden box.

B, (Fig. 2,) a frame placed across the box, supporting the cloth C.

C, a cloth of woollen, fastened to the arms of the frame B; the middle of which is nailed to

D, a perpendicular board reaching across the middle of the box, and making two apartments therein.

E, a crank, by which the frame B is made to have a vibrating motion; this is shown in dotted lines, in Fig. 1, as is also

the vibrating frame with its cloth, &c., the former being at the back, and the latter within the box.

F, (Fig. 1,) the circular top of the box, with its hinges.

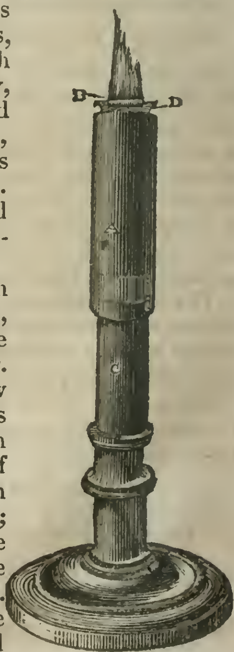
Remarks by the Editor.—This machine differs *in form*, from two others previously patented, one of which was noticed in our last number, as having issued on the 28th of April, to Mr. George Henning, and the other at p. 31 of our last volume, as patented by Mr. D. Baldwin. The resemblance between those of Baldwin and Henning would, we think, be apparent to any one, and, to us, it really appears that this of Mr. Gregory, is the same in principle; we have witnessed decisions in court establishing the identity of two machines which differed much more in the arrangement of their parts than do either of those now before us. There is one circumstance worthy of notice, namely, that all these three patentees are inhabitants of the same town, and the machines afford *prima facie* evidence of a common origin. Under such circumstances it is certain, that the only security which the patent law can afford to inventors must be derived from their claims being liberally viewed, and rigidly sustained by our courts of law. There are but few machines of any considerable complexity which we would not undertake so to modify and distort, that, to all common observers, they should appear to be essentially different, whilst, in fact, they remained essentially the same. The modifications of the mechanical powers are numerous; one may frequently and readily be substituted for another, without affording the slightest claim to invention. If after a man has devised a machine, his neighbour may in this way rob him of his just dues with impunity, the patent law becomes a mere false light, to allure men to their destruction. Any one who has paid the strict attention to the progress of inventions which we have done, is well aware that whenever a machine which is, or appears likely to be, useful, is patented, it is immediately succeeded by numerous patents for modifications of the same thing, by men who *swear* that they really believe themselves to be the *true* and *original* inventors or discoverers. A custom house oath has been long a by-word, but really when persons who have only crooked a lever, or substituted a screw for a wedge, will swear that they have invented a machine, the sacredness of the averment must be as little felt, and its fallacy as palpable, as the testifying to a false invoice. Were we at liberty to do so, we could furnish some illustrative anecdotes, which might go far to change the reference from a custom house, to a patent office oath. Inventors frequently complain of the patent law, as affording them no security; the patent law is undoubtedly susceptible of much improvement, but after all the possible emendations have been made in this statute, its value must depend solely upon an enlightened jurisprudence.

Specification of a patent for an improvement in the production of Artificial Light, in the burning of tallow, or oil, and other fatty substances. Granted to ISAIAH JENNINGS, *City of New York, May 20th,* 1830.

To all whom it may concern, be it known, that I, Isaiah Jennings, of the city of New York, have invented certain improvements in the production of artificial light, both in the burning of tallow and oil, and others kinds of fatty substances, which improvements consist in part in the mode in which tallow, or other suitable substances may be formed into candles, and in part in the structure of the apparatus in which they, or other fatty substances, are burned, and that the following is a full and exact description of the same.

1st. When hard fat is to be burned, I form it into a candle, which I usually make of about two inches in diameter, and from four to twelve inches in length; these are made by casting the fat into a mould; the wicks are made flat, and about one inch and a quarter wide. These I usually make of cotton cloth, folded so as to give to the wick the desired thickness; it is cast in the tallow in the usual way.

A suitable stand, to be used as a candlestick, is prepared to receive this candle; the upper part of this stand (C,) is made cylindrical, and about the same diameter and length as the candle; the length, however, may be varied considerably. A glass tube (A,) is prepared, which is open at both ends, usually about nine inches long, and of such diameter as will allow the candle to slide freely, though tightly, in it. When the candle is placed upon the stand, or candlestick, above described, the tube is slid over it, until its upper edge is nearly on a level with the top of the candle. This glass tube is made capable of being passed down over the cylindrical part of the candlestick, as the candle burns away.



A strip of brass, or other substance, which I call a wick hold, (D,) is passed over the wick, (B,) in order to prevent its burning below the edge of the glass tube, and also the cylinder. The wick holder is of such a length as to allow its ends to reach across, and rest upon the glass tube; it has a slot, or mortise, of sufficient length and width to pass over the wick. The ends of the wick holder may be notched so as to form checks to retain it in its place upon the tube; or two or more flat or round wicks may be placed near the outer edge of the cylinder, the wick holders being so formed as to correspond.

A candle of this description will burn a whole evening without requiring to be snuffed, and

may be decreased in length about one and a half inches. The glass tube may be then slipped down, the wick cut to a suitable length above the wick holder, and the candle relighted.

Soft grease or oil may be burned in a tube of this description, by having hard tallow at the lower part, or by making it tight with some other substance; or cork, or other elastic substance, may be used for the same purpose, pouring the grease or oil in above it, and allowing the wick to hang loosely from the wick holder within it; as it burns down it may be replenished, or the tube slid down as before.

A candle of the above kind may be made of any desired length or diameter; it may, for example, be two feet in length, and the glass tube need not be more than four inches. The tube may also be made of earthenware, or of any bad conductor of heat; a good conductor would melt the tallow throughout the whole length.

A glass burner may be placed over the flame if desired.

What I claim as new in the foregoing, is the glass, or other tube, that is a bad conductor, sliding over the candle, in the manner, and for the purposes described. Isaiah Jennings.

ENGLISH PATENTS.

To Donald Currie, *Esq. for a method of preserving Grain and other Vegetable and Animal Substances and Liquids. Communicated by a Foreigner.* Dated January 31, 1828.

My said method of preserving grain and other vegetable and animal substances, is, by inclosing them in air tight vessels, vaults, or other proper receptacles, from which I extract the atmospheric air as much as possible, and replace it with carbonic acid gas, procured by any of the well known methods; as, for instance, by the combustion of charcoal, or by fermentation; and thus I prevent the tendency of the grain to vegetate, and greatly hinder the decomposition of the other vegetable and animal matters which is ordinarily so greatly promoted by the action of the oxygen contained in atmospheric air.

The liquids must be put into tightly corked, or otherwise closed bottles, or other fit and proper vessels, and be then inclosed in a similar manner in air tight vessels, vaults, or other proper receptacles, filled with carbonic acid gas, which will hinder the usual destruction of the corks or other closures, and consequently, preserve the said liquids in a more complete manner than has hitherto been effected. [*Rep. Pat. Inven.*

To Thomas Stirling, *Slater, for improvements on Filtering Apparatus.* Dated August 16, 1828.

Mr. Stirling's filtering apparatus consists of a vessel of considerable depth in proportion to its other dimensions (as represented

in the drawing) divided into five compartments horizontally, (of from six to twelve inches or more in height, according to the size of the vessel,) by four diaphragms, or transverse partitions, the lower one of which is perforated for a space of about six inches square in its middle, with several holes, small below and enlarged conically upwards; over these holes a piece of wire gauze is to be placed, and above that another diaphragm or plate, having an opening six inches square in its middle, is to be cemented to the former. The second transverse partition differs only from the first, in having the conical holes bored near its sides, instead of in its middle; but the third is again formed like the first in this respect; while the fourth, or upper one, is perforated in all parts indiscriminately.

The lower compartment is occupied solely by the water to be filtered, which is conveyed into it by a pipe screwed into its side, which turns up outside, at a height proportioned to the force with which it is desired that the water shall pass upwards through the filter. The second compartment is filled with fine river sand: the third with the same material mixed with carbonaceous matter, or with a species of sand procured from the River Carron in Scotland; and the fourth with bits of "*scoriæ*," from the Carron founderies, broken so as to be from one-eighth to one-quarter of an inch in diameter; while the fifth, or upper compartment, is occupied by the pure filtered water that has passed through those different beds of materials.

The vertical pipe is furnished with a cock, where it enters the lower compartment; another cock is also placed in the bottom of the latter, to discharge the impurities left there by the ascending water, and a screw plug is inserted in the side of the same, to close an aperture, through which a brush on a wire handle, such as is used for cleaning bottles, may be introduced to detach sediment from the internal surfaces of the compartment, when required to be purified; at which time water may be let to run in from the pipe to assist the operation. A third cock, placed in the side of the upper compartment, to deliver the pure water when required, completes the apparatus.

The patentee recommends the use of slabs of slate for the formation of vessels for filtering, when of a moderate size, of which two pieces are to be grooved at the edges to receive those of two other pieces to form the sides; all of these are grooved near their lower edges to receive a horizontal piece that forms the bottom, which with the rest constitutes the vessel. The transverse partitions are supported by upright pieces placed close to the sides of the vessel, and are cemented at their edges to them by mastic or other cement, to prevent the passage of water in any place but through the conical perforations; the edges of the bottom piece, and of the two plane sides, are also cemented to the grooves in which they are fitted; and the whole is kept together by horizontal screw bolts, furnished with nuts, that pass through parts of the side pieces, which project beyond their grooves.

When the filtering apparatus is to be of a very large size, the ves-

sel or cistern may be formed of iron plates, or of bricks or stones, united by water proof cement.

The use of having the conical holes placed at the edges of the second transverse partition, is, to cause the water to traverse a larger portion of the filtering materials in passing to them from those in the middle of the lower one, and from them to those in the middle of that next above them in position.

OBS.—We consider the general arrangement of this filtering apparatus to be commendable, particularly as regards the filtration by ascent, the provisions for cleansing the lower compartment, where the water enters, and the use of slate slabs for its cistern, when not of too large a size, as we consider this material to be as little liable as earthenware to defile the water. Stone slabs, however, have for several years been used in France for filtering vessels, which, perhaps, might have suggested to the patentee the employment of slate for this purpose.

We are not, however, quite so well satisfied of the advantages of the sand and broken scoriæ from Carron, recommended for filling the filtering compartments. If by scoriæ is meant, as we suppose, the dross that is removed from the surface of the pig iron when in fusion, it appears to us that the water would be liable to contract some flavour from the iron, which remains unvitrified in its composition, and that the sand would incur a similar objection; but should this be the case, the defect is easily remedied by substituting pure silecious sand and gravel for these materials.

It also appears to us, that the apparatus would be improved by having its transverse partitions so contrived as to be occasionally removed, in order to cleanse all the compartments and renew the filtering materials, that evidently must become foul after any considerably protracted employment. This alteration we think might be easily effected, and seems to us much preferable to cementing the edges of these partitions, as directed by the patentee, and which must of course preclude this displacement. [*Ib.*

To WILLIAM SHAND, *Esq. for a certain improvement or improvements in Distillation.* Dated August 10, 1829.

THE apparatus which constitutes these improvements is represented in the drawings of the specification, as consisting of three wooden vessels, or vats made of wood or other slow conductor of heat, through the side of the first of which, near the top, is introduced a pipe that communicates with, and is attached to, the beak of the still. This pipe widens at its lower end, and is placed like an inverted funnel over a small cavity formed at the bottom of the vat. A similar pipe passes from the first to the second vessel, and from that again to the third, and so on in succession, if more vats than three be employed; to the last, however, is attached a worm, which is immersed in a vessel of water, as in ordinary cases.

The bottoms of the vats are formed of wood, and have the cavity before noticed, cut in the centre somewhat larger than the funnel suspended over it; a plate of copper or other metal is fixed under them, furnished with cocks and pipes for conveying off the water with which the cavities are filled; the use of which latter will be presently explained. The tops of the vats are made of copper or other quick conductor of heat, and have domes formed in their centres; funnels furnished with cocks are placed near these for filling with water the cavities at the bottom of the vessels. Small pipes communicate with the lower part of each vessel in order to convey to the still the condensed vapours that have accumulated there; and in order to facilitate their passage, the bottoms of the vessels rise in gradations.

The patentee states, that in causing the vapour to pass through the water contained in the cavity, it will be divested of a portion of its empyreuma, and, consequently, a much more pure spirit will be obtained. In case, however, the strength of the spirit be a greater object than its purity, he directs the inverted funnels at the extremity of the pipes to be drawn above the liquid contained in the cavity. The tops of the vessels being formed of metal, the action of the atmosphere on the outside will be generally found sufficient to condense the aqueous vapour, while the alcoholic part passes on to the worm: should this fail to produce the desired effect, water is directed to be admitted on the top of the vats, the quantity and continuation of which is regulated according to circumstances.

A modification of this arrangement is described, in which the several vats are formed by an equal number of partitions placed perpendicularly in a square vessel, with the pipes arranged as in the former instance; but instead of placing water over the vessels for condensing the aqueous vapour, the wash intended for distillation is appropriated to that purpose, and is surrounded by a covering with a pipe leading to the still to prevent any vapour from escaping which might be formed by the heat of the copper domes.

Mr. Shand concludes the description of his invention, by stating it to be "applicable to the distillation of any fluid obtained by the evaporating of a gas or vapour, composed of gases or vapours, condensible at different temperatures." [*Ib.*

To THOMAS SALMON, *Malster, for an improved Malt-kiln.* Dated July 8, 1829.

THE object of this patent is to cause a portion of the heated air employed in the preparation of malt, to operate on the surface of the wet grain or green malt.

In the drawing accompanying the specification, the floor of an ordinary kiln is represented, formed of flat tiles with numerous perforations, and at equal distances from each other are placed three inverted funnels, which may be made either of tin, iron, bricks, or other materials that will bear heat; the lower extremities of these

funnels (which the patentee terms "*rarifiers*") are square, and each fits into a space formed by the removal of one of the perforated tiles: a slide passes through the upper part of the rarifier to regulate the admission of heat, and is directed to be so placed, that it shall be above the greatest quantity of grain that is prepared at one operation. When the wet grain is spread on the floor of the kiln, the slides of the rarifiers are withdrawn, and a portion of heated air passes upwards through the funnels and spreads itself throughout the chamber. The patentee states, that this method causes the malt to dry quicker, and that less steam is condensed on the roof. He concludes by recommending the aperture at the top of the kiln to be contracted to three feet, if the area of the floor be twenty-seven feet square, and in like proportion for other sizes. [*Ib.*

Account of a patent granted to David Lawrence *and* John Crundwell, *Gunmakers, for improvements in the Gun Locks for Fowling Pieces, and other Fire-arms, September* 15*th*, 1829.

This invention applies to locks on the percussion principle, and has for its objects, first, the protection of the percussion caps or powder, and the lock from injury; and, secondly, the prevention of accidental discharges of fowling pieces. To accomplish the first, all the parts of the lock except the tricker are placed within the stock in a recess which is covered by a protecting plate turning on a hinge at one end, and kept in its place by a spring-catch at the other: this plate is made to open for the introduction of the percussion powder or caps, which being shut in are perfectly secured from external injury. To prevent accidental discharges, these patentees employ a security pin, which fixes the tricker until it is released by the pressure of the hand against a small lever situated in the stock, and projecting about the sixteenth of an inch at the lower part where the left hand grasps in the act of firing. By this simple arrangement it is evident that no discharge can take place unless the pressure on the projecting lever, and on the tricker, be simultaneous, which renders an accidental discharge almost impossible.

[*Register of Arts.*

Account of a patent for improvements in the manufacture of Ropes and Cordage. Granted to George Harris, *Sept.* 15, 1829.

The specification first describes a new fluid composition discovered by the patentee, which he applies to cordage, canvass, and fibrous fabrics generally, with the view of preserving them from mildew, and increasing their durability; and, secondly, a new fibrous material, for the fabrication of cordage, canvass, &c., to which also is to be applied the new composition.

The basis of the composition is obtained from "certain plants, trees, and vines," called the Ficus Indicus, which grows on the coast

of Africa, and in the East and West Indies. At the proper season of the year, (the wet season) incisions are to be made in the bark of these trees, whence will exude a milky fluid, which is collected in suitable vessels, and afterwards exposed to a "boiling heat," which causes the "pernicious and aqueous particles to evaporate, and thereby prevent the liability of the remaining extract to ferment." Afterwards, there is to be mixed with it in a warm state, (from 80° to 100° temperature) "one gallon of cocoa-nut, palm, or other oil (not essential oil,) to every twenty-five gallons of the extract." In this state it is fit to be imported into this country, where, before it is used in saturating the substances before mentioned, there is to be mixed with the composition 1 lb. of bitumen, or "asphalt," to every 20 lbs. of the composition; and if this is not sufficiently liquid for certain purposes, then is to be added so much more of the before-mentioned oils as will bring it to the required consistency.

The plant from which the fibrous matter is obtained is also stated to be the native of Africa, and the East and West Indies, and is called the silk plant. The leaves of this plant are collected in the green state, then beaten by machinery (or other means) to separate the fibres from their husky envelopes. The fibres are then to be washed, dried, and sent to England. Here this new material is to be manufactured in a similar way to hemp and flax: the first process is called *hitchelling*, and the hitchelling instruments, instead of being oiled, are to be smeared with a portion of the new composition, and subsequently to the hitchelling, a further portion is to be rubbed over the fibres by hand. In the next process, that of spinning, the spinner is to be provided with a tin case, and a cloth saturated with the composition; in the former he is to dip his fingers, by which he delivers the fibres, and the saturated cloth which he holds in the other hand spreads the composition upon the yarn as it is formed. In all the subsequent steps of manufacturing the composition is applied, and the cordage so prepared is said to be much stronger and more durable than that of the ordinary kind.

The patentee describes also in his specification a peculiar method of forming the cordage for naval purposes, which, being wholly given in technical terms, would not be understood but by very few of our readers. It is also stated that canvass prepared in the yarn with this composition, does not require the usual sizing to lay the *haul*, which is considered to be detrimental to it; and that ordinary cordage prepared with it need not be twisted so hard as it is usually, by which its strength is impaired. [*Ib.*

Account of a patent for improvements in the concentrating of Cane Juice, solutions of Sugar, and other fluids. Granted to JOHN ATCHISON, *September* 15, 1829.

By Mr. Atchison's process, the evaporation is conducted in vacuo by the heat from steam. The cane juice or solution of sugar is placed in a semi-cylindrical copper pan, having flat semi-circular

ends; on the outside of which, about two inches apart, is another pan of a similar figure to the former, the space between them being used to contain steam as a medium for conveying heat to the saccharine fluid in the internal pan. The two vessels are secured together steam tight by flanches on their upper edges, which projecting outward, serve as points of support to the double vessel, which thereby rests on the upper side of a quadrangular iron frame, constructed as a stand for the reception of the whole apparatus. Inside of this double pan, is placed a cylindrical vessel, having likewise an external case, the space between the two being also used as a steam chamber for conveying heat to the matter under evaporation. This cylindrical drum is connected by means of radiating hollow arms to a centrical hollow axis placed in a horizontal position, on which the cylinder is made to revolve at any required speed, through the agency of toothed wheels situated externally. The revolving cylinder is of such dimensions with respect to the pan, as when placed within it, for the outside of the former to be about three inches from the inside of the latter. The steam is received from a boiler conveniently situated, into the hollow axis, whence it enters a box at one end of the cylinder, from which proceeds four hollow arms; through these arms the steam passes, then circulates between the two surfaces of the cylinder, making its exit from thence, through four other hollow arms at the opposite end of the cylinder, where it passes through another central box to that extremity of the axis; thence, proceeding downward, outside the apparatus, through a curved pipe, it enters the steam chamber formed by the cavity between the sugar pan and its jacket, or external case; the water produced by the condensation of the steam running off from the bottom through an open cock. As the aqueous portion of the solution in contact with the metallic surfaces is soonest expelled, the condensed saccharine matter quickly attaches itself in strata over those surfaces, to remove which as they form and re-mix the sugar with the thickening solution, three scrapers formed of straight bars of wood are employed; these are covered with woollen cloth, and are constantly made to operate by the revolution of the axis of the cylinder: a pinion on this axis drives another pinion on the axis of a crank, from which two rods proceed, giving an alternating motion to a scraper, which continually scrapes the bottom of the sugar pan; the scraper which operates upon the external side of the revolving cylinder is fixed longitudinally over it, (or out of the range of the alternating scraper last mentioned,) and the scraper which cleanses the interior of the cylinder, is suspended from the axis of the latter, and operates solely upon the bottom, by the effect of its gravity against the surface which is constantly passing under it.

To cause a vacuum in the sugar pan, it is closely covered over by a wooden case, having on the upper part a revolving fan or vane, fitted in a small circular box; a rapid rotation is given to this by a small pulley on its axis carrying an endless cord, which passes round a large pulley on the axis of the revolving crank before mentioned. The air and vapour is thus rapidly drawn off, the ebullition is in

consequence conducted at a lower temperature, and there is less risk of injuring the goods. The solution when sufficiently concentrated, is drawn off by a valve at the bottom of the pan.

There is much to admire in this apparatus; heat is well economised by it, and it is an elegant and scientific arrangement; nevertheless, we much doubt whether it will not be found rather inconvenient in clearing out the solution, and especially the sugar which will attach itself to the hollow radiating arms, for the cleansing of which there is no provision made by the patentee. As no practical mode of effecting this object has occurred to Mr. Atchison, we would suggest to him a very simple one; which is, to put heavy metallic rings loosely on the radiating arms, which would be constantly traversing their surfaces, as the cylinder revolved, and keep them clear of incrustations. [*Ib.*

FRANKLIN INSTITUTE.

Twenty-sixth Quarterly Meeting.

The twenty-sixth quarterly meeting of the Institute was held at their Hall on Thursday evening, July 15th, 1830.

Mr. S. V. Merrick, was appointed chairman, and

Wm. Hamilton, secretary pro tem.

The minutes of the last quarterly meeting were read and approved.

The quarterly report of the Board of Managers, and also of the treasurer, were severally read and accepted, when, on motion it was resolved, that the report of the Board be referred to the committee on publications, to publish such parts as they may deem expedient.

The committee appointed at the last quarterly meeting to fit up the rooms in the hall recently occupied by the United States courts, for a reading room, and cabinets of models and minerals, presented the following report, viz.

The committee appointed at the stated meeting in May, to receive donations, and fit up the reading rooms of the Franklin Institute, report:

That in conformity with the instructions of the Institute, they proceeded immediately to take measures to effect the object of their appointment.

The sum of 406 dollars has been subscribed (towards defraying the expenses incurred in preparing the rooms) by members of the Institute; a list of the donors, with their respective amounts, is herewith presented. Many other members have promised their aid, but have not yet subscribed; their names will be reported at the next meeting of the Institute, together with a catalogue of books presented, with the donors' names. So soon as the committee felt authorized by the amount subscribed, they gave the necessary instructions for making the cases, &c.

In concert with the committee on minerals, they have prepared the north-east room for their use, by arranging in them the cases taken from the first and third stories. These cases your committee

believe will be sufficiently commodious for the present wants of the Institute, and they would respectfully urge the immediate arrangement of the minerals therein.

The model cases from the lower rooms have been arranged at the west end of the hall, which, with the space allotted for models on the tops of the book cases, will afford ample room for present purposes.

Your committee had prepared, eight book cases to stand in the recesses on each side of the windows, intended as the commencement of a general plan to be completed at a future period, by continuing them to the ceiling, extended over the windows, to be approached by a gallery round the room even with the base of the upper cases. This they believe will be found the most economical arrangement, and one giving ample space for the library for a considerable space of time. The committee would call the attention of the members to the vacant shelves, under the hope that either by donation or loan of books, they will assist in placing the library of the Institute on a more respectable footing.

Exchanges for the Journal have been effected with numerous periodical works, and about 25 newspapers, which it is believed will be much increased. Your committee recommend that the rooms be opened to members under suitable regulations, from and after the monthly meeting, on Thursday next, and they feel confident that so soon as the present arrangements are known to the members, the hall of the Franklin Institute will become a point of attraction to the mechanics of Philadelphia generally.

Your committee have prepared rules and regulations for the government of the reading rooms, which they herewith present for your consideration, and, if adopted, they would respectfully recommend that the actuary should be instructed to have them printed on a card, and distributed to each member of the Institute.

The cases, it will be perceived, are not yet finished, the sashes being in the glazier's hands; they will, however, be completed before the monthly meeting.

The committee beg leave, in pursuance of the foregoing suggestions, to offer two resolutions for the consideration of the Institute.

1. Resolved, that the actuary be instructed to give public notice in the newspapers, that the reading rooms of the Franklin Institute will be opened for the use of members, on Thursday, July 23d, and remain open daily between the hours of 3 and 10 o'clock, P. M.

2. Resolved, that the actuary be instructed to have the rules and regulations for the government of the reading rooms printed on a card and transmitted to each member of the Institute.

All which is respectfully submitted, by order of the committee.

S. V. Merrick, *Chairman.*

Philadelphia, July 14th, 1830.

The above report having been read, together with the accompanying rules and regulations for the government of the reading rooms

and library, it was on motion accepted, and the regulations were ordered to lay on the table until the next monthly meeting.

S. V. MERRICK, *Chairman.*

WM. HAMILTON, *Recording Secretary pro tem.*

The Twenty-sixth Quarterly Report of the Managers of the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts.

IN compliance with the constitution, the Board have the pleasing duty of presenting at this meeting, their twenty-sixth quarterly report.

The last quarter has been rather one of preparation for future exertions, than of active operations; as the season of the year when many of the members are dispersed throughout the country, or too deeply engaged to admit of their devoting much time to the Institute, renders it necessary to suspend the lectures, &c.

The Board have, however, been occupied in the prosecution of some of the objects which had long been before the Institute, and have much pleasure in advising you that progress has been made in several of these, but not sufficient as yet to warrant the publication of their proceedings.

Of these the most important, perhaps, is the inquiry into the advantages of the several forms and constructions of water wheels, which the committee who have the subject in charge, have been incessantly occupied in prosecuting. The results which they have already obtained justify us in hoping that, when completed, the investigation will be found productive of useful and interesting observations upon a subject which, however extensive in its applications, has hitherto been attended with much uncertainty and obscurity.

The Board have much satisfaction in adverting to the arrangements that have been made for the improvement of the reading room department of the Institute, by the appropriation to this object of the large hall in our building, which has been restored to us in pursuance of the arrangements lately made with the Marshal. By the liberal donations from a number of our members, the library has received large and valuable accessions of books; and through the laudable zeal of the committee appointed by the Institute, at their last quarterly meeting, a handsome subscription has been raised for the purposes of arranging the books, minerals, and models of the Institute. It is hoped that the measures that have been adopted will be found to unite economy with convenience; at the same time that they are such as to admit of further extension, as the library and collections of the Institute become enlarged, and we indulge in the belief that the members will now find at the Institute sufficient attractions every evening, to induce such of them as are not better engaged, to visit it frequently and avail themselves of the resources for instruction which it affords them.

The Board having observed with great pain the numerous acci-

dents that had lately occurred in the boilers on board of steam boats, were led at their meeting of the 13th of May last, to institute an inquiry into the causes of these accidents; that inquiry is now in progress. The committee to whom it has been entrusted have issued a circular soliciting information from all persons conversant with the subject. Until this information be collected, all conclusions as to the causes of the accidents, and the remedies to be applied, would be premature. The Board have seen with great pleasure, that the subject had been brought up for discussion at one of the regular monthly meetings of the Institute, and from the interest which it excited, they deem it unnecessary to extend their observations upon this subject at present; they will confine themselves to inviting the Institute to entertain favourably the request which the special committee on that inquiry have resolved to make, which is, that this question shall for some time to come, be considered as a standing topic of discussion at all the meetings of the Institute, and that all the members be earnestly invited to communicate to the committee either verbally or in writing, "the result of their observations, experience or reflection upon this subject."

Believing that in an institution of the nature of ours, it was our duty by all fair and reasonable means, to strengthen the ties which attach the members to the body at large, the Board have resolved to have a handsome diploma or certificate of membership engraved. At their last meeting they adopted a design proposed by our fellow member, Mr. Thomas Sully; it will be executed as soon as possible, and then distributed to the members under such regulations as may be deemed expedient, and which will be duly communicated to the Institute.

The Board having been advised that inconvenience was supposed to exist among some of the members, from the manner in which the by-law relating to the annual payments of the members was worded, have determined to amend it so that any member elected at any time during the financial year, ending on the 30th of September, shall be called upon for the payment, not of the whole annual subscription, but merely such part of it as shall be proportionate to the unexpired time, avoiding all fractions of months.

A vacancy in the Board having occurred by the resignation of our esteemed fellow member, G. Fox, Esq. Professor Alexander Dallas Bache was elected to supply his place.

The Board neglected to notice in their last quarterly report, the resignation of Mr. Ashbel G. Ralston, and to inform the society that they had filled his place by the election of Mr. Wm. H. Keating, formerly one of the most zealous and efficient officers of the society, and whose return to our city, and his co-operation in promoting the object of our institution, the Board consider a subject of congratulation to the society.

In conclusion, the Board would beg leave to remind our members that their biennial exhibition of the products of American industry and ingenuity will take place in the middle of September. The Board are satisfied that the progress of our manufactures in the last

two years, has been very great, but with a view that our display may be proportioned to the importance of the subject, and that it may not fall short, but, if possible, surpass the very brilliant ones which we have hitherto had the good fortune to hold, it becomes every member of the Institute to consider how he may facilitate our success by his exertions in the cause. Every member has it in his power to assist either by sending products of his own industry, or by inviting those of other persons in this or in any of our sister states. We have reason to believe that no exertions of our committees, however great, have as yet been adequate to the dissemination of information on this point in the interior of Pennsylvania, and still less in remoter districts. We earnestly, therefore, invite the attention of our members to it, especially of those who can contribute to it from their own manufactories and workshops.

All which is respectfully submitted.

S. V. Merrick, *Chairman.*

Wm. Hamilton, *Actuary.*

Monthly Meeting.

The stated monthly meeting of the Institute was held at their Hall on Thursday evening, June 24, 1830.

Mr. S. J. Robbins was appointed chairman.

The minutes of the last meeting were read and approved.

The following donations were presented to the Institute, viz.

By Mr. John Grigg.

Coxe's and Cooper's Emporium, 5 vols.
The works of Flavius Josephus, in 2 vols.
The History of Ancient Greece, by Gillies.

By Mr. James Hogan.

The Elements of Natural and Experimental Philosophy, by Cavallo.
Mackenzie's 5000 *Receipts.*
Principles of Political Economy, by Malthus.
Italy during the Consulate and Empire of Buonaparte, by Botta.
Letters from Paris, by Didier.
A Tour from New York to Detroit, by W. Darby.
Descriptio Uberior Graminum, by Muehlenberg.
A General History of Birds and Quadrupeds, by Bewick.
Creation; a Philosophical Poem, by Blackmore.
The History of France, by W. Grimshaw.
The Life of Napoleon, by W. Grimshaw.
The Grammar of Astronomy, by J. Towle.
A Grammar of Chemistry, by D. Blair.
Lectures on Rhetoric, by D. Blair.
History of Animals, by Webster.
The American Constitutions.

By M. Carey, Esq.

The History of the World, by Guthrie, 10 *vols.*

By Thomas P. Jones, M. D.

The Speech of Mr. Frelinghuysen, in the Senate of the United States.

The Speech of Mr. Barton, in the Senate of the United States.
The Speech of Mr. Holmes. *do.* *do.*
By Mr. Samuel T. Jones.
A History of the Cotton Manufactures, by Guest.
By Isaac Hays, M. D.
Rapport sur Les Lampes Hydrostatiques.
By Mr. S. C. Atkinson.
The Casket, for 1827, 1828, *and* 1829.
By R. La Roche, M. D.
Intorno Alla Direzione Degli Aerostati.
By Lt. Col. S. H. Long.
Narrative of the Proceedings of the Board of Engineers of the Baltimore and Ohio Rail-road Company, also
A twenty feet model of the "*Jackson Bridge*," constructed and patented by himself.
By Jacob Pearce.
A specimen of graphic granite.

The corresponding secretary laid on the table the following works, received in exchange for the Journal of the Institute, viz.

Annales de Chimie et de Physique, for December, 1829, and January, 1830.
Bulletin de la Société d'Encouragement pour l'Industrie Nationale, for December, 1829.
Programmes de Prix Proposes, for 1829, 1830, 1831, and 1832.
Recueil Industriel, for December, 1829, and January, 1830.
Bibliothéque Physico-economique, for February and March, 1830.
Annales des Mines, Nos. 4 and 5, Vol. 6, 1829.
The North American Review, for July, 1830.
The Southern Review, for May, 1830.

Professor Alexander D. Bache, on behalf of a committee appointed by the Board of Managers at their meeting held on the 10th inst.

Reported, that the Board of Managers had appointed a committee to inquire into the probable causes of the explosion of the boilers used on board of steam boats, and if possible to devise, or recommend the best means by which the unfortunate occurrences can be prevented or guarded against.

That the committee had commenced discharging the duties assigned to them; that they have had several meetings, and had a circular prepared to be addressed to such persons as were acquainted with the subject, (which circular was read) and also the proceedings of the Board of Managers on the subject; he also stated that the committee recommended to the Institute to adopt the following queries as a subject of discussion at their meetings for that purpose, viz.

1st. What are the probable causes of the explosions of boilers on board of steam boats?

2nd. If any, what are the best means to obviate the recurrence of these evils, or to diminish the extent of their injurious influence, if they cannot be wholly guarded against?

3d. By what means can these remedies be applied and enforced?

On motion, the report was accepted, and the questions recommended by the committee were adopted for the discussion at the monthly meetings.

The chairmain stated that the subject of the explosion of steam boilers was now before the meeting for discussion, when Professor Johnson laid on the table a part of a boiler which had been exploded, and made some remarks on the subject, and was followed by Col. S. H. Long, Professor A. D. Bache, George W. Smith, Esq. and several other members, after which the further discussion of the subject was, on motion, deferred until the next monthly meeting.

On motion, adjourned.

Samuel J. Robbins, *Chairman.*

Isaac B. Garrigues, *Recording Secretary.*

Observations and inquiries respecting the materials employed in the fabrication of Detonating Powder. By Joshua Shaw, Esq.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—Having been obliged, by your attention to my former communications, I have taken the liberty in this instance, to ask for information, instead of furnishing any myself. It proceeds, however, from a conviction that if my queries are answered satisfactorily, they will be of some general service to the community. Should it not be in your power to reply to the matter in question, it might be so far worthy of your attention as to allow me to seek it through the medium of the Journal of the Institute.

It will be recollected that in April, 1829, I made a communication respecting fulminating powders, (page 271, vol. iii.) and with the view of complying with some remarks made by yourself, and which immediately follow that communication, I have devoted a very considerable portion of time to the performance of a series of experiments, with a view to the furnishing such a statement as would be found useful and satisfactory. I commenced with the oxy-muriate of potash, sulphur, and charcoal, a composition totally forsaken as respects its use in small arms, though I am still in the habit of employing it as a priming for my percussion locks for cannon, which have been introduced on board our public armed vessels. In this lock I have preferred to use the powder made with the oxy-muriate of potash, not because I think it equal in general to the fulminating mercury, but because it presents in this particular application of it, some advantages over the mercurial compound. In making the preparations from the oxy-muriate, I had occasion to purchase a quantity sufficient for several thousand primers, and had some difficulty in obtaining it. After much inquiry, I met with five or six pounds, but in two different parcels, one labelled *Muriate sur ozigené potasse. Pharmacie de Paris*, the other labelled *Chlorate de potasse*, &c. &c. I was assured at the time of purchase, that the two articles were perfectly similar; not, however, being satisfied, I inquired of one or two persons who professed to understand chemistry, as to this fact, but, to

my surprise, could not obtain a satisfactory answer. I made several trials with each of the parcels, and found the one labelled oxy-muriate much the strongest, as it fired with a lighter blow, and gave out a larger quantity of gas, but even this was much inferior to what I had been in the habit of procuring.

From my experiments, I have been led to conclude that these and what I have formerly used, are all the same article, good, middling, and bad; their differences arising from carelessness in the making. After this long preface, allow me to propound the following questions.

First. Are oxy-muriate of potash and chlorate of potash, the same thing, or are they different articles, only bearing a strong resemblance to each other?

Secondly. Is there any ready and convenient test by which their purity, or degree of adulteration can be detected? If not, I believe it would be better to abandon the use of this article altogether in making priming powder for cannon, excepting our government should take this business into their own hands, when there would be no difficulty in procuring the best from abroad, or having it prepared at home, by giving orders for it in quantities sufficient to induce the manufacturer to prepare a first rate article; inducements which an individual, depending on small and temporary orders from the government, cannot hold out.

I have no doubt but that these simple inquiries may cause those learned in chemistry to smile, but this I am willing to bear, provided I can obtain the necessary information, as I shall then be prepared to furnish a statement of the value of the several fulminating powders used as a priming for cannon and small arms, particularly those made from oxy-muriate of potash, and from fulminating mercury. Without this information I may be deceived by the use of an article of inferior quality, and the value of my statements be consequently destroyed.

Yours, very respectfully,

JOSHUA SHAW.

Remarks by the Editor.—We are not of the number of those who are inclined to smile at the difficulties which the practical man frequently encounters from the want of theoretical knowledge. The professed chemist finds it no mean task to keep pace with the progress of his science, and more especially with those numerous mutations which have taken place in the nomenclature, to suit the theory or the fancy of its professors. The salt in question has, in English, been called hyper oxygenated muriate of potash; oxygenated muriate of potash; oxy-muriate of potash, and chlorate of potash; and there have been French names corresponding with each of these, two of which occur in the foregoing paper. The chemist knows the reason of these changes, and cannot easily realize the difficulty which they create in the minds of others, who expect to meet with the same thing under the same name.

The two portions purchased by Mr. Shaw ought to have been pre-

cisely alike, and any difference between them must have arisen from the impurity of one or both. The following may serve as good practical tests of the comparative value of different parcels. If the chlorate (oxy-muriate) of potash be mixed with sugar, and the mixed powder be touched with a thread, or stick, dipped in sulphuric acid, (oil of vitriol,) combustion will take place; that which will burn most rapidly and completely with the smallest portion of the salt, is the best. The chlorate and the loaf sugar also should be triturated in a mortar, and the two mixed together intimately in given quantities. If the quantity of chlorate be sufficient, there will be so complete a combustion of the sugar as to leave scarcely any residuum. With a smaller portion the residuum will be greater, and with a portion just sufficient to produce ignition, it will be considerable.

Chlorate of potash and sulphur mixed together, explode by the blow of a hammer on an anvil. This property also may supply a test. That salt which will, in the smallest proportionate quantity produce an explosion, is the best.

The largest quantity of this salt which we ever saw together, was of our own manufacture; it weighed eight pounds, and was of the utmost purity; the process was continued for four days. This was 17 years ago, when chemical manufactories were but little known here, and war interfered with the importation of the article. We would willingly give the process for the information of any one who wished to essay it, but do not think this now necessary. Any of the chemical laboratories at which the chlorate of lime (bleaching salts) is manufactured, could readily supply this salt, and we have no doubt would undertake to make it in a quantity not exceeding ten or twelve pounds. The process is one which does not present any difficulty to the chemist, but to one not habituated to chemical manipulation, it would be not merely difficult, but extremely unpleasant.

The salt, when good, is in thin scales of a beautiful pearly appearance.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

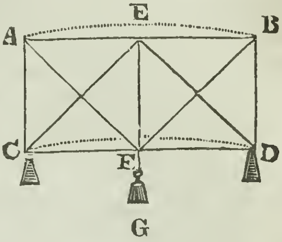
Remarks on the Jackson Bridge. By Lt. Col. S. H. Long, *the patentee.*

A description and drawings of this bridge have already been given in the April number of this Journal. We now take occasion to offer the following remarks explanatory of the principles and manner of action that take effect in consequence of the peculiar arrangement of the parts of this structure.

The principles aimed at in the construction of this bridge, are such, that the strain to which the truss frames are subjected, by the heaviest load that is admissible upon the bridge, is no greater than that exerted upon it without any load at all. Paradoxical as this may appear, it is, nevertheless, demonstrably the fact, with respect to all parts of the bridge, except the arch braces, and those parts

merely which are in contact with the sleepers or bolsters, upon which the bridge is sustained.

In demonstration of the truth of this proposition, we have only to inspect the annexed diagram, which may be regarded as representing one of the truss-frames, and in which AB represents the upper, and CD the lower string; AC, EF, and BD, three posts, EC and ED the main braces; and FA and FB, the counter braces. Suppose the frame deprived of the counter braces, and the strings occupying the position of the curved dotted lines, let a weight, G, be suspended at F, heavy enough to depress the frame to the straight line AB and CD, as represented in the figure. Let the counter braces FA and FB be now inserted; after which let the weight G be removed. It is obvious that the strings AB and CD will still retain their straight direction, and the addition of the weight will have no other effect upon the truss-frame, than merely to relieve the counter braces of their action, the stress or strain upon the truss-frame remaining the same, whether the weight is sustained by it or not.



If keys or wedges be applied at A and B, over the heads of the counter braces, and driven in such a manner as to communicate an appropriate thrust from A and B, towards F, we have the strain upon the truss-frame completely exemplified, without the use of the weight.

However the number of spaces in the truss-frame may be multiplied, if the additions be made equally on both sides of the centre, or in both directions from E and F, the same system of action will be communicated to all parts of the truss-frame situated between the abutments of the bridge.

The timber best adapted to the construction of a frame bridge, is white pine. The qualities which entitle it to this distinction are, its lightness, stiffness, and exemption from the ravages of worms, insects, &c. Cypress, yellow pine, white cedar, hemlock, poplar, and chesnut, are to be regarded as among the most valuable substitutes afforded within the limits of the United States. Yellow, or hard pine, is probably better adapted for the necessary keys and wedges than any other material; but when those are not to be had, white ash, white oak, locust, or chesnut, may be used to advantage. The timber employed, especially in the frame work of the bridge, should be perfectly sound, free from sap, knots, shakes, splits, twists, and all other defects calculated to impair its strength, tenacity, and durability; and should be of the character denominated "quartered timber," or timber cut through, and deprived of the heart or pith.

The splicing pieces, when constructed of wood, should be of the same timber as that of which the strings are composed. Splices of cast iron are, however, deemed more efficient and economical, when they can be procured with convenience.

The flooring should be of yellow, or white pine, if practicable; and in all cases, the material of which it is made should be the light-

est attainable. The exterior covering, should it be applied, ought also to be constructed of the lightest materials.

The wrought iron employed on the bridge is intended merely to clamp, or bind together, the parts of the structure, and is to operate exclusively by tension, independently of any transverse strain, or leverage, upon the bolts, &c.

Table showing the dimensions of string pieces for spans of different lengths; as also the area of the floor, and the weight that may be sustained, if distributed over the surface, independently of the weight of the bridge.

Statements.	Length of Span.	Height of Truss Frames.	Transverse dimensions of the string pieces, exclusive of notches, holes, and defects of all kinds.								Area of the bridge floor.	Load that may be sustained on the bridge.	Aggregate transverse area of each string.
			For single action.				For double action.						
			2 side string pieces.		1 centre st'g p'ce.		2 side st'g pieces.		1 centre st'g p'ce.				
No.	*Feet.*	*Feet & parts.*	*Width in inch. & pts.*	*Depth in inch. & pts.*	*Width &c.*	*Depth in inch. & pts.*	*Width in inch. & pts.*	*Depth in inch. & pts.*	*Width in inch. & pts.*	*Depth in inch. & pts.*	*Sq'e Feet.*	*Tons & parts.*	*sq. in. & pts.*
1	60	13.5	3	3.25	5.5	3.25	,,	,,	,,	,,	1200	64.32	37.33
2	70	13.5	3	4.5	5.5	4.5	,,	,,	,,	,,	1400	75.4	50.8
3	80	13.5	3.5	5.33	5.5	5.33	,,	,,	,,	,,	1600	85.76	66.37
4	90	13.5	4	6.25	5.5	6.25	,,	,,	,,	,,	1800	96.48	84
5	100	13.5	4.75	6.5	6.5	6.5	,,	,,	,,	,,	2000	107.2	103.7
6	110	14	5.5	7	6.5	7	,,	,,	,,	,,	2200	117.92	121
7	120	14	6.5	7.87	6.5	7.87	3.75	6	5.5	6	2400	128.64	72
8	130	14.5	7	8	6.5	8	4	6	5.5	6	2600	139.36	81·5
9	140	14.5	8	8.25	7	8.25	4.75	6	6.5	6	2800	150.8	94·6
10	150	15	8	9.13	7	9.13	4.87	6.5	6.5	6.5	3000	160.8	104·9
11	160	15.5	8	9	7.5	9	5.62	6.63	6.5	6.63	3200	171.52	116·6
12	170	16	8.25	10.63	7.5	10.63	6.5	6.63	6.5	6.63	3400	182.24	127·5
13	180	16.5	8.25	11.63	7.5	11.63	6.5	7.13	6.5	7.13	3600	192.96	138·6
14	190	17	8.5	12	8	12	6.5	7.75	6.5	7.75	3800	203.68	149·9
15	200	17.5	8.5	13	8	13	7	8	6.5	8	4000	214.4	161·3
16	220	18	,,	,,	,,	,,	8	8.25	7	8.25	4400	235.84	189·8
17	240	18.5	,,	,,	,,	,,	8.13	9.5	7	9.5	4800	257.28	219·8
18	260	19	,,	,,	,,	,,	8.25	10.5	7.5	10.5	5200	278.72	251·1
19	280	19.5	,,	,,	,,	,,	8.25	12	7.5	12	5600	300.16	283·8
20	300	20	,,	,,	,,	,,	8.25	13.5	7.5	13.5	6000	321.6	317.6

NOTE.—In the last column of the foregoing table, the statements, No. 1 to No. 6, inclusive, exhibit the areas of the strings as computed for "single action," while the residue of the statements represent the areas for "double action."

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Some observations on the Patent Laws of the United States; intended to call public attention to that important subject. Addressed to the Managers of the Franklin Institute.

I have, gentlemen, noticed in the public prints, the appointment of a committee on the the part of the Franklin Institute, to enter upon inquiries respecting the causes which have produced so many steam boat accidents, and, if possible, to discover a remedy by which their future occurrence may be prevented, and was much gratified to find this inquiry undertaken by an institution expressly organized for the purpose of improving the mechanic arts, and composed of gentlemen well qualified for the undertaking; in such hands there can be little doubt that a remedy as effectual as the nature of the case will admit of, will be discovered.

The writer of the present communication is anxious to call the attention of the Institute to another subject which, so far as property is concerned, he believes to be of equal importance to the community, and equally within the purview of your society. He alludes to the patent laws, the glaring defects of which are proverbial, as they are neither calculated to stimulate, or to protect the inventor. They appear not to be well understood, even by the best counsel, and are so differently interpreted by the courts, that it is next to impossible for a specification of a patent to secure any right to the proprietor of a valuable invention; it consequently so happens that men of genius and talents aware of these facts, feel no disposition to risk their time and capital in making new or useful discoveries, or even putting those into operation which they have discovered. The expense usually attending the bringing them to perfection is very great, as numerous trials, and frequently the erection of expensive machinery are requisite, and, if at last successful, the invention is open to infringement as soon as it shall be known to afford remuneration to the inventor; and the pirate, availing himself of it, proceeds to work with every advantage, without previous cost, loss of time, or even a claim to ingenuity. It is, therefore, the opinion of every man informed upon the subject, that the patent laws require to be revised and corrected, if not entirely re-modelled. A committee appointed by the Franklin Institute, could not, it is believed, be better employed than in digesting some mode of securing to the inventive mechanic his just reward. I know not where such a measure could originate with equal advantage to the community at large, or where it can be expected to be better understood. Congress, it cannot be doubted, would listen to, and be ready to act upon, any well digested plan that might be presented to them which should appear well calculated to secure the important ends for which the patent law was originally passed. I will here call to your recollection a fact which is well known to you, and appears to me illustrative of the opinions which I would enforce. I allude to the premium offered by the managers, or superintendents, of the rail-road constructing between

Manchester and Liverpool, as it will at once demonstrate the advantages which are attainable when a certainty of indemnity is presented to those who may succeed in perfecting a valuable invention. Five hundred pounds were offered for a certain purpose, and the result produced by it was not only unexpected in regard to its value, but wonderful and extraordinary in itself as a proof of science and ingenuity. What was the charm which could produce so sudden an effect? did not the patent laws of England, like our own, hold out the prospect of a reward much above five hundred pounds? they did, but the uncertainty involved in their construction destroys them as a guarantee to the mechanic; they are, like our own, indefinite. The premium was otherwise, it was comprehensible and comprehended. It was a happy thought in the person who first suggested the experiment; he was, no doubt, well acquainted with the springs of human action, and the history of man. We are not, however, to suppose, that it was the bounty alone which produced the effect, for it was trifling in comparison to the expenses to be incurred. It was the certainty that if the party succeeded, he would be remunerated by the extensive use of the machinery, and a claim secured to all the fame and reputation which were sure to follow in the train, as they did not rest upon the frail tenure of the patent laws alone. If, however, they were such as they ought to be, the bona fide inventor, or discoverer, would require no adventitious reward; the fruit of his own talents and industry would satisfy him were these secured to him.

Every inventor of this description would be willing to submit his claim to a jury of scientific men, who were at the same time practically acquainted with the mechanical and chemical arts, and thus competent to the undertaking. They having decided on the merits and originality of an invention, should pronounce judgment accordingly, and the claim be made to rest upon it. In this way there would be every thing to hope, and little to fear; instead of this, however, we are referred to laws which are acknowledged by the judges themselves to be so framed as to be quite indefinite; and liable to be differently explained by different persons. It is notorious that the judges have decided the same points in a way the very opposite of each other, relying upon antiquated precedents made to operate in different ways, according to the sapient reasonings which have been laid down by men perfectly destitute of all mechanical knowledge. The merits of an invention, in all cases, should be decided upon the principles of equity.

One lawyer tells you that *an effect* cannot be patented, because some great counsellor has held that opinion, or that some judge has pronounced upon it. Let us try this maxim by the rule of common sense. If an effect be produced which is new, and of great public value, and perhaps discovered at great expense to the inventor, why shall it not become his property, even though the materials employed, and the method of operation, have both been long known and in use, but not so combined and employed as to produce the same effect. But one judge invalidates, or negatives one thing, and another a se-

cond, so that an inventor has scarcely a tenter hook left him upon which to hang a single assurance of protection. It has been repeatedly stated that if a patentee discover an error in his specification, he may amend it by cancelling his patent, that is, by surrendering it and petitioning the secretary of state to issue it anew. Such is the doctrine of some of the judges presiding in the United States courts; and many patentees under this impression, and trusting to such advice, have surrendered their rights, and paid an additional thirty dollars into the treasury, to be better secured: but will they believe that other judges equally eminent for their legal knowledge, have declared that such patents are void on the face of them? It was so declared not many days ago in the District Court of the United States, in the city of New York; but, said the judge, you can appeal to the Supreme Court, and in the mean time you may proceed to try the merits of your claim for damages. The case was opened, and a violation of the patent proved. It was also held that the patentee was the original inventor. It was also in evidence that whilst the plaintiff, who was an alien, was waiting for the completion of the two years, the time prescribed by law before a patent could be granted to him, his invention was betrayed, for a bribe of ten guineas, in a foreign country, by which it appeared that the public became possessed of it, and this was held to be good reason for voiding the patent; neglect was charged to the plaintiff in omitting to take out his patent sooner than he did, although it was proved that it was during the period when he did not possess that privilege, that it was betrayed.

A good invention is, to the inventor, frequently a bill of expense only, since it may be stolen from him, or violated with impunity. If he make a change in any of the parts connected with his machine, or improvement, although such change shall enhance, materially, the value of it, without at all altering its principle, this is deemed sufficient to void it, on the ground that he has himself abandoned it, and introduced changes not mentioned or contemplated in the specification; or it will be said that he has secreted from the public the best method within his knowledge, and therefore has failed in complying with the law; now though this sort of argument might be good in respect to certain compounds, or quack medicines, good or bad, and which the public have no means of analyzing, yet it cannot be applied to the mechanic arts; there is no secret mystery in a piece of mechanism; no magic power can give it motion, but those laws which govern natural causes, and produce corresponding effects; and yet this jargon is held and applied indiscriminately in all cases involving rights, *secured*, as it is termed, by the patent laws. It sometimes happens that an invention is of so singular a nature that the most learned lawyers have been heard to say that it was in particular cases impossible to make a specification which they could not themselves destroy. The lawyers say that two or more parts of an invention must be new, when it may really happen that a valuable invention may consist of a single ingredient matter or thing; sometimes it may consist of one or more parts which are really old, but by cer-

tain modifications they have been applied to a use entirely new, and have become extremely valuable, but you are told that merely varying the shape of a thing will not be good for a patent. In short it is impossible in the greater number of cases, owing to the uncertain phraseology of the laws, and the various opinions of the judges, as to their meaning, to secure any property under them; and it is almost impossible, where the rights of an inventor are violated, for him to obtain an injunction to restrain the violating party from further proceedings. How stands the matter in regard to all other property? is it not necessary for a person claiming a right to property in the possession of another, to sue for it, and to procure a verdict before he can take possession of it? does justice distinguish betwixt property consisting in houses and lands, and that which is acquired at greater risk and toil, and by the exercise of genius and talent? If there is any distinction to be made, it should be reversed, because a useful invention is valuable to the whole community.

From these and other considerations, it is, in common with many others, the opinion of the author of the foregoing remarks, that something should be done to effect a total change in the patent laws, so as to give to a most useful class of men, that security which was no doubt intended by the framers of the existing laws, but which from various causes have been found totally inapplicable, failing to effect the purpose. It is, therefore, believed that if the Managers of the Franklin Institute would undertake to investigate and point out the inconveniences of the present laws, and suggest such alterations and revisions as would render them available to the inventor, they would perform a service invaluable to the community at large, and one which would be honourable to our national character.

I am, with great respect, &c. &c.

A FRIEND TO THE MECHANIC ARTS.

Remarks by the Editor.—With the main proposition of the writer of the foregoing observations we agree perfectly, namely, that the law for granting patents for useful inventions is defective, and requires revision. Whilst, however, we admit this most fully, we do not believe it to be possible, or were it possible that it would be proper, to enact such a law as would be satisfactory to patentees. We are convinced from long experience, and careful observation, that the complaint about not having their rights defended, is made, in a very large majority of cases, by those who have no rights, of the kind in question, to defend. Every man when he has obtained a patent, feels as though, by the payment of the fee, he had acquired a right to the thing patented, and that this right is violated if the law does not protect him. Now this is altogether a false view of the question. The greater number of patents are obtained for things which are either old or frivolous, and have no claim, therefore, to respect; almost every one will admit this to be true in the abstract, but no one in his own case; the public, however, must be the arbiter, and the hopes which had their foundation in error be disappointed.

The patent law is not intended to confer any right, but to confirm

those already existing. A man has discovered, or invented, something new, and he has a natural and inherent right to it, he may in many cases practice the thing secretly, and in all he may suppress it; the idea is his own, and no man has a right to extort it from him. That this kind of property may become available both to the inventor and to the public, a law has been passed giving to him an exclusive right for fourteen years, upon condition that it become public property at the end of that time. From the very nature of the case the allegations upon which a patent issues must be *ex parte*. The applicant states that he has effected a certain object, and that it is new; and the patent is then granted. What could be more monstrously unjust than that such a claim should not be liable to be traversed? In most cases the patentee is deceived, or is a deceiver, and the public is not, in either, to be made the victim. If I enter a tract of new land, and obtain a patent for it in the proper office, and put my patent upon record, will this make the land mine, and will the defence of my claim be a public duty because I have paid the fee? certainly not; if I have lapped upon, or taken another man's property, or that of which the public had no right to dispose, neither my patent or its record will do me any good.

The project of a *Board of men of practical science*, is a favourite one, and has been frequently advocated; when the idea is pursued, however, we meet with difficulties upon the very threshold of the inquiry. The main object proposed by the establishment of such a Board, is the final security of the patentee; but it must be recollected that there is another important interest to defend, that of the public, and this would be felt by such a Board, to the discomfiture of a host of applicants, who, if justly dealt by, would complain more loudly than they now do. How will you contrive to make such a Board infallible? and if you cannot make it so, will you yet allow it to pronounce final decrees? to declare that the invention of one man is old, and that of another new? Before this is done we must repeal our free constitutions, and abrogate the right of trial by jury.

These are but hints, and we have not time for more, nor indeed do we wish to enter the lists at present, although we are anxious that the question should be fully discussed. It may be imagined by some who read these remarks, that we are lukewarm on the subject of revising the patent law; such, however, is not the case, and it may hereafter appear that it is one in which we have engaged with untiring zeal.

Should our friends write upon this subject, as we hope they will, if they wish their essays to be read, they should be brief. Three or four pages at a time are as many as can with propriety be devoted to such a question.

On French embossed and other works in flattened Straw.

In a late volume of the *Dictionnaire Technologique*, we find an interesting article on this subject. This manufacture, before the

French revolutionary war, had been confined to religious establishments, and especially to those of the Carthusians; and it is to an artist of this class, that the editors of this respectable work are indebted for the first publication of the particulars of the several processes employed in it.

On the choice of the Straw, and its preparation.

The straw of all cereal plants is not equally fit for these kinds of works; we must choose that which is the whitest and the thinnest, and whose tubes are the largest and longest. The two-rowed barley, *hordeum distichon*, L. possesses all these desirable qualities. It differs from the common or square-eared barley, in its head being flat, long, and having only two rows of grains; its beards and stems are rough to the touch.

At the approach of the season for gathering it, and when the heads are formed, they visit the fields where it is grown, and select the finest straw, of a yellow colour; they then cut it with scissors, near to the ground, deprive it of its leaves, and examine whether or not it be spotted. The mists and the rain in the spring, produce black spots, which it is impossible to remove; and we must therefore give the preference to those parts of the country where the straw has least suffered from this defect. Before collecting it, an agreement is made with the proprietor of the field, for leave to cut it carefully, provided that the heads be given to him, and which must also be cut off with scissors.

The stems are also separated into lengths with the scissors, by cutting them above and below the knots, which are rejected as useless, as are likewise the sheaths, and the small stems at top, which have too little width to be of any use. The most beautiful tubes are those which are the size of an ordinary writing quill, thin, and free from spots.

When the straw has thus been deprived of its useless parts, the tubes are selected according to their lengths, and placed in boxes, divided into compartments.

On bleaching the Straw.

When the selection has been made, it is necessary to bleach the straw, and especially that which is intended to be dyed of delicate colours; as we cannot be ignorant that, in any ordinary dyes, we cannot procure fine colours, unless the matters intended to be dyed approach near to a perfect whiteness. And, although the straw is generally yellow, yet it is not difficult to give it a fine white appearance. We employ the liquid chlorate of lime for this purpose, in a similar manner to that used in the ordinary bleaching processes; but it is blanched much more easily than linen, and even than cotton.

We need only take this trouble for the most delicate colours, such as a light rose colour, flesh colour, a tender lilac, a pale yellow, celestial blue, or azure, &c. For the less delicate colours, the bleaching of the straw by means of sulphur, is sufficient.

On bleaching the Straw with Sulphur.

The vessel most commonly employed for this operation, is a hooped cask about three feet high, and open at both ends. About the middle of this vessel, a net, strained upon a hoop, is lodged, the hoop resting upon several nails, driven into the sides of the cask for that purpose. The straw, in handfuls, bound round with thread, is laid upon this net, and crossed with other similar bundles, till the vessel is full. It is covered with a lid, similar to that of a snuff-box, the inside of the rim of which has woollen list nailed around it, in order to cause it to perfectly close the top of the vessel. The whole is also enclosed within a woollen envelope. We must also not forget, either to nail or glue paper all over the inside of the vessel, in order to close all the crevices, which might otherwise suffer the sulphureous acid gas to escape through them.

All being thus disposed, we place underneath the vessel, a chafing-dish, full of burning charcoal, over which we have placed a sheet-iron pan, containing a layer of sulphur. The sulphur, on being heated, inflames; and the sulphureous acid gas disengaged, fills the inside of the vessel, and bleaches the straw. Three or four hours are sufficient for this operation. Care must be taken that the sulphur is thinly spread over the bottom of the iron pan, as, should it be laid in too great a quantity, it would unite, and form a flame, which might reach too high in the vessel, and tinge the straw with an unchangeable blackness. This operation should always be performed in the open air.

When we no longer perceive the odour of the sulphureous acid gas, we uncover the vessel, and remove the bleached straw.

On the preparation of the Straw before dying it.

There are certain colours which the straw will not well take, unless it has been previously opened. This operation used to be a tedious one, but we have considerably shortened it by an instrument of our invention.

The straw must not be in a perfectly dry state, when we proceed to open it, as then, on seizing it at one end, it would break, and be unfit for use. We therefore let it lie all night on the flagged pavement of a ground-floor; this communicates a humidity to it, and damps it sufficiently to enable us to open it readily, and to dress and flatten it.

Formerly, we used a taper wooden spindle, to open the straw with; and, taking the tube of straw in the left hand, with the right hand we introduce the smaller end of the spindle into the bore of it, and, by inclining the spindle in a proper manner, we form a cleft, which we extend the whole length of the tube, by quickly pushing the spindle along in the direction of the cleft. The straw is then spread open upon the spindle, by rubbing it with a bone or ivory polisher, formed in the shape of a folding-knife. The flattening of the straw is then completed by rubbing it forcibly with the polisher on its bright side, whilst it is laid upon a strong and smooth plank of apple tree. This operation, which is to be performed upon each

tube of straw, we think is too tedious; and we have, accordingly, substituted the following in place of it.

We employ a pair of cylindrical rollers, mounted in a frame, in a similar manner to those commonly used in the manufacture of straw-plait to flatten it; and, in front, we affix to the cheeks of the frame, by means of screws, a steel instrument, made in the form of a snipe's bill, which is pointed at the front end, and spreads or widens towards the rollers; the underside of this instrument is made flat, and its upper side is angular, its sides being formed into sharp edges. This instrument serves both to open the straw, and to guide it beneath it between the rollers. This construction being understood, the following is the manner of using the machine. We take the moistened straw in the left hand, and cause the pointed end of the snipe's bill to enter the tube of it, and thrust it forwards; the straw rends, and we continue to push it forwards, at the same time turning the rollers, by the right hand, applied to the winch or handle of them, until we see that the straw is seized between the rollers. We then lose hold of the straw, and continue to turn the handle, until the straw has passed through the rollers, and falls completely opened and flattened, at the back of the rollers. We can thus prepare as many as ten thousand straws in a day; whereas before we were only able to prepare about a hundred! The straw thus prepared is now ready to be dyed.

On the process of dying the Straw.

Blue.—We take an ounce (thirty grammes) of fine Guatemala indigo, in powder, and place it, in a medical phial, upon a sand-bath; we then add to it two ounces (sixty grammes) of the sulphuric acid of commerce. When the effervescence has ceased, we add fifteen grammes of pure potash. It is then left in digestion for twenty-four hours.

This composition serves to dye blues of various shades. To use it, we put into a proper boiler, placed over a fire, the necessary quantity of water to completely cover the straw which we would dye. When the water boils, we then add the prepared sulphate of indigo, by the help of a wooden spoon, fastened at the end of a staff, and by small portions at a time, until we see that the bath has attained the shade we desire. We then remove the boiler from the fire, and throw the straw into it, but which, however, has not previously been opened or flattened. We keep the straw immersed, and when it has received the proper tint, we withdraw it, wash it in cold water, and leave it to dry.

Sky-blue or azure.—Prior to receiving this delicate colour, the straw must be opened or flattened; it must then be arranged in layers, in a square vessel of glazed earthenware, the layers crossing each other. We then take a portion of the remaining part of the blue dye, put it into another vessel, and add warm water to it; also stirring it to complete the mixture, as well as also adding more water, until we have obtained the required shade; when the bath is thus prepared, we pour it upon the straw, disposed as above mentioned,

and with pieces of wood placed in the vessel, and bent in the form of a bow against its sides, we force the straw to continue immersed in the dye. When it has received the proper tint, we wash it, and leave it to dry.

Yellow.—This colour is prepared with *curcuma*, in powder, which we boil in water, until it has received the shade we desire; we then throw into it the straw, in its entire state, not opened, and let it boil, until its tint is satisfactory, when we treat it as directed for the blues.

We dye with the residue of this bath the pale yellow shades upon unopened straw.

Green.—The straw dyed of these shades of yellow, when plunged into baths more or less blue, affords greens of different hues.

Red.—We must use for this colour, and all its shades, straw which has been opened and flattened in the manner above described, for receiving the sky-blue or azure dye; and it must also be disposed in a similar manner, in glazed earthen vessels. So likewise the finest straw, perfectly free from spots, must be chosen. The following is the composition of the bath.

We must procure from the dry-salters the dyed woollen threads, in skeins, tinted with a red colour, approaching to scarlet; and boil them for several minutes in water, which holds a little alum in solution; the wool gives up nearly all its colour to the water, and when it has attained the required shade, we pour it upon the straw, and suffer it to remain till cold. The dyed straw must then be washed and dried.

In default of scarlet wool, we may dye a red with cochineal, in the manner practised for silk dying.

Rose and flesh colours.—These are dyed with the residuums of the red dyes, which are to be heated, and be poured boiling hot upon the straw, disposed in the same manner as for dying azure.

Violet.—For this colour we employ the dyed sky-blue straw, and tint it in a rose bath, according to the required shades.

Lilac.—This straw is first dyed azure, and then flesh-colour.

We likewise dye straw of different shades of red, with Brazil wood, and by means of orseille.

Browns.—The various shades of these colours in straw, are first dyed green, then yellow, then red, and, finally, in a bath of Campechy wood (log-wood.)

Black.—The straw is first to be treated with galls, then in a bath of pyrolignate of iron, and, lastly, in one of Campechy wood.

On pasting the Straws.

The straw, whether of its natural colour, bleached, or sulphured, is never employed until it has been previously formed into plates or sheets; that is to say, it must be polished anew, flattened, and pasted, the one straw by the side of the other, upon leaves of thin paper, in order to prevent them from becoming too thick for use.

Each plate or sheet generally consists of from fifteen to twenty straws, according to their width. They commence by selecting

them one by one, in order to regulate their tints; as it is proper to mention, that all the straws, although dyed in the same bath, will not equally present the same tint.

After being thus selected, their edges are cut straight. In order to this, they are placed upon a stout plank of apple-tree, well planed, the straw being spread upon it, with its polished side downwards; it is then nearly covered with a thin blade of iron, the edges of which are perfectly straight, in such a manner, that a thin thread of straw may project beyond the edge of the rule or blade; this thin thread is then to be cut off, by means of a very sharp knife, passed along it, close to the edge of the rule; the knife resembling in form an erasing knife, or lancet.

After having thus regulated each straw, on both its sides, and having prepared a sufficient number of all colours, they are to be cemented upon paper, by means of flour paste. We must have at hand a good screw-press, formed wholly of iron, of an improved construction, and of which we shall presently give a description. Upon the flat table of the press, on which the screw is destined to act, we place several small and thin planks of walnut, and between every two planks, three or four leaves of paper. It is between these planks, and in the midst of the paper, that we place the leaves of pasted straw.

This press is, as before said, constructed entirely of iron. Its top and sides are formed of a flat bar of iron, with spreading shoulders, and tenons below, the tenons passing through holes made to receive them, in the bed or table of the press; and holes are made through the lower ends of the tenons, to receive wedges, by means of which, the sides and top of the press-frame are securely bound to the table of it. The sides and top are formed, as before mentioned, of a single bar of iron; the top being flat, and having a circular hole in its centre, to receive the upper end of the stem of the screw of the press, and to steady and guide it; this smaller part, or elongation of the screw, being made cylindrical for that purpose. The sides of the press-frame are formed by the iron bar being bent at a right angle on each side, and prolonged until they reach the table of the press, and are secured by the wedges underneath it, as before mentioned. A cross-bar is passed through holes, formed in the sides of the press to receive the ends of it, at about one-third part of the height of the press, and is firmly secured by screws and nuts. The female screw of the press is formed in the centre of this cross-bar, which is thickened or strengthened there for that purpose; and two diagonal stays or braces pass from the sides of it, and are inserted in the upper corners of the frame, thus affording a great resistance to the upward movement of the female screw. The screw has a fine sharp thread; and below it, cross holes are made through the solid part, to receive an iron pin or lever, by which the screw is turned either way, as required. Below these holes, the lower end of the screw is connected with the moveable iron plank of the press, by means of a garter-piece, in the usual manner, so as to hang from the end of the screw, and yet allow the screw to turn round within the central

aperture formed in its upper surface for that purpose. The ends of the moveable plank have gaps formed in them, which receive the sides of the press-frame within them, and thus the plank is steadied in its movements upwards and downwards.

A dozen thin walnut planks are placed upon the table of this press, and between every two of them a small paper book is laid, which is composed of two sheets of paper, or of eight quarto pages, and thus there are uniformly diffused among them nine books of paper. Finally, these thin walnut planks are surmounted by another of oak, of an inch in thickness, the same size as the smaller or thinner planks.

By the help of these instruments, we now proceed to paste the straw, prepared as above directed.

We first spread upon a smooth table a leaf of very thin paper, the size of the intended plate of straw. We then cover this paper all over with flour paste, by the aid of a proper brush, and we then paste upon it one straw after another, side by side, beginning at one edge of the paper, and thus proceed, taking care that the straws neither overlap each other, nor leave any gap between them; we then wipe them over with a proper cloth, in order to be assured that we have thus removed all the superfluous paste, and with a sharp scissors we cut off, not only those parts of straw which exceed the paper in length, but also a small slip of the paper itself. We then place this pasted plate under the first plank in the press, between the leaves of paper, and, by means of the iron pin or lever, placed in one of the holes made through the lower end of the screw, we give it a slight degree of pressure, taking care not to compress it too forcibly.

We then take another leaf of paper, and paste straw all over its surface, in the above manner, and place it beneath the second plank in the press, between the leaves of paper. We then withdraw the first pasted plate of straw from the press, and remove it from between the leaves of paper, and which can be readily done, because the paste has not become quite dry; we then leave the damp papers to become dry, and replace the sheet of pasted straw between dry papers. We next lay it between the two lowermost planks in the press, and give it a considerable degree of pressure.

We continue proceeding in the same manner until we have finished as many leaves of straw as the press will contain. We also change the papers at least once, and when all are finished, give them a powerful pressure, and do not touch them until the next day. We then unscrew the press, and remove all the plates of straw, which are then placed between the leaves of a large book.

Having thus procured a complete collection of plates of straw of all colours, in order that we may not be stopped in the completion of any works we may desire to make, we shall proceed to describe the methods of working it.

Manner of working the Straw.

The works in straw with which we are now occupied, are those *in*

relief, or more properly speaking, *in bas relief.* The manner of giving this relief to the designs is, by embossing them in moulds, by means of the press. But before describing these extraordinary works, it is of importance to make known the instruments which are indispensable thereto.

On the manner of making the Moulds.

In order to execute all kinds of work, it is necessary to have a great number of moulds. An example of a medallion will be sufficient to understand the mode of operating. Supposing that we would take the portrait of Charles the Tenth, we employ a five-franc piece. We likewise choose the newest piece which we can procure; we then take a plate of horn, well extended, flat, and polished on one side (the cutlers and comb-makers prepare these plates of horn.) We then cut it square, a little larger than the coin; we next heat strongly, but not red-hot, two plates of forged iron, each an inch thick, and larger than the horn plate, and place one of them under the press; these iron plates should not be heated so hot, however, as to burn the horn. Upon this hot plate we lay two or three pieces of thick pasteboard, moistened a little, and upon these we place the coin with its reversed side downwards, or that which bears the arms of France, from which we do not intend to take a mould; and upon the face of the coin, which is oiled a little, we place the polished side of the horn plate in such a manner, that the sides of the square should be upright, or correspond with the position of the portrait on the coin; upon these we then lay the other iron plate, heated in the manner above described, so as not to derange their position; we then lower the screw of the press, and squeeze them by degrees. The horn, on becoming heated, softens; we continue to press gently until we perceive that the thickness of the horn is diminished sufficiently to cause us to judge that all the parts in relief of the coin are well impressed into the horn; we then cease to press, and leave the whole to become cold, but do not unscrew the press until twenty-four or thirty-six hours afterwards.

When all is become perfectly cold, we release the press, and shall find a hollow mould of horn exceedingly sharp and well defined, without the coin being injured in the slightest degree.* We next pierce a hole at each angle of the horn plate, and fix short brass wire pins in each, riveting them firmly by blows of a hammer applied upon the back of the plate. These pins are tapered a little on the face side of the mould.

* The Editor has a horn mould in his possession, evidently taken in this manner, from an exquisite medal of Maria Theresa, two inches in diameter, and in which the most delicate markings of the hair, the embroidery, &c. &c. are admirably preserved. He met with this mould at a broker's shop in Somer's Town a few years since; it, no doubt, having been brought over from France by one of the emigrant priests, at the commencement of the revolution, and was evidently intended to have been employed in embossing straw in the manner described in this article. It however also forms an excellent mould for making casts in plaster of Paris.

The mould being thus prepared, we proceed to make a *force*, or counter-mould. In order to do this, we take several leaves of pasteboard, which we paste together one upon another, and whilst they are still moist, we apply them upon the horn mould in order to receive the impressions of the four pins, and then bore holes through the pasteboards, to correspond therewith, with a pointed instrument. We must employ at first a sufficient thickness of pasteboards so as not to endanger the pins, and add to them successively until the thickness of the force, or counter-mould, when laid underneath the press, shall exceed the length of the pins the eighth of an inch at least.

We then place the whole under the press, and squeeze them carefully, so as not to damage the pins. We also add to the thickness of the pasteboards, if necessary, and when it is become sufficient, we give a strong degree of pressure, and continue to increase it, until we have obtained a perfect impression from the mould in the pasteboards. Sometimes we are obliged to paste small pieces of paper upon the impressed side of the pasteboards, in order to fill the large cavities of the mould, which we could not otherwise accomplish; but every time that we make these additions, we should likewise paste a leaf of paper over the whole surface, in order to retain these additional parts in their places, which otherwise would be liable to become detached.

[TO BE CONTINUED.]

On improvements in the art of painting in Water Colours, by Mr. C. J. Robertson. *From the Transactions of the Society for the encouragement of Arts, Manufactures and Commerce.*

In the hope of being useful to the lovers of painting, I send you a specimen of a new method of painting in water-colours, the result of experiments pursued for some years, in the hope of enabling water-colours, in some measure, to compete with oil. How far I have succeeded in producing the force and brilliancy of an oil picture, the Society of Arts will be enabled to judge, from this copy of the splendid picture of Titian, in the National Gallery; but my method possesses some peculiar advantages in durability, and in a facility of cleaning, which are, I do not hesitate to assert, superior to oil; and as also in a picture painted in this manner, not requiring a glass, as it may be cleaned with alcohol at any time, as often as you please, and without suffering the slightest injury; and every one knows, who is at all acquainted with the subject, that alcohol will instantly and entirely remove any dirt, that a picture may be subject to receive; but it is used with considerable danger to paintings in oil. I have paintings by me, which have been painted several years, and always exposed to light and air, and which, nevertheless, have not undergone the slightest change; and the method may be applied to paintings on a much larger scale, with, I have no doubt, equal success.

The paintings before you (a copy of the Bacchus and Ariadne, by

Titian,) is painted on what is called Bristol-board, or paper, attached with glue or paste to canvass, and which is again effectually protected from the action of the atmosphere, known to corrode the canvass of oil paintings, and also from any injury arising from humidity, by attaching tin-foil, by means of paste, to the back of it.

After drawing in the outline purely and carefully (by purely, I mean, in a single, clean, and sharp line,) with a black-lead pencil, rather hard, that the black-lead may not disturb the purity of the colours, I wet the paper all over with water, in which a small quantity of ox-gall is dissolved, and then lay a foundation tint, of finely-ground blue-black* (with the usual portion of gum arabic,) to represent the shadows and half tints, laying them on in succession, and carefully adhering to the contours, without softening their edges, the first tints rather faint and covering all but the extreme lights; after I have laid in several gradations, I take a large soft brush, and plenty of water, and wash off as much as will come away, taking care always to leave the lights clean; I repeat this, washing in and washing out, till the shadows *appear* as strong as the picture is intended to be, and no more will wash off; the half tints ought to be much stronger than may appear necessary, as they lose their apparent depth of tone in a remarkable degree, when the other colours are applied. When the foundation tints are nearly dry, I then lay on the carnation tints of the flesh with *madder lake*,† which is perfectly durable, and wash off in the same manner till it is not to be removed by washing; when these are strong enough, I wash on, in a very dilute state, yellow (stone) ochre, or raw terra di Sienna; in the brown flesh, burnt terra di Sienna: this, if done decidedly and with sufficient force, will bring the flesh nearly to its effect; the stronger shadows are given with Vandyke brown, burnt umber, or raw umber, mixed with madder purple, madder brown, or Indian red, according to circumstances; these last need not be washed off again. When I have got the whole picture to as much force as it can be brought in the usual way, the whole drawing should be washed over with a thin solution of gum tragacanth‡ in water, with a large brush; in doing this, care must be taken not to repeat the stroke in the same place till it is dry, and not to leave it in masses any where, as that would occasion a streakiness. The best way of doing it is, to lay it on in parallel strokes, the latter ones always touching the edges of the former ones; this operation may be repeated several times, allowing the paper to dry in the intervals, and it affords an excellent surface for working on, and will bring out the colours in a surprising degree, and yet without giving the smeared appearance, like the traces of snails, that gum arabic gives. The picture must now be worked up to its greatest strength, always co-

* For the satyrs, and browner figures, I used Vandyke brown, and the colours may be sepia, or any others that may suit the picture; but I think these three will answer every purpose.

† For the flesh of women and young persons; for others, Indian red, and Venetian red.

‡ It is better also to add a small quantity of gum arabic to it.

vering it with the solution of gum tragacanth, till it appears finished; it must then be varnished over with a solution, in spirit of wine, of isinglass previously soaked in distilled water. This will increase the strength, brilliancy, and durability of the picture, and as dry isinglass is not soluble in spirit of wine, except at the boiling temperature, so it is evident that it may be cleaned with cold alcohol with impunity.

The trees in the specimen are painted in body colours, to show how capable they are of being united with the other parts; and indeed any part of the picture might have been painted in body colours. In general, I paint all except the flesh in body colours, varnishing it first with the solution of gum tragacanth, and finally with isinglass. By using all the colours separately and unmixed, except for the dark shadows, the colours appear so much brighter, that none of the bright colours that are at all doubtful need be used: in this drawing, with the exception of the madder colours, they are all earths; no yellow brighter than yellow ochre being necessary. The lights will thus always maintain their purity, and the dark tints their full depth, which is not the case in oil, where the former grow darker, and the latter become mealy. The varnish necessary to bring out the dark tints again, becomes gradually opaque, and must, after a time, be taken off, with considerable danger to the picture, even in skilful hands.

This method is, therefore, particularly calculated for perpetuating valuable pictures in copies, as I am thoroughly persuaded it undergoes no change at all.

Method of manufacturing Melting Pots for Iron and Steel. By Mr. C. S. Smith.

[From the Transactions of the Society of Arts.]

The failure of a pot is a serious inconvenience, both on account of the loss of time and of metal, as well as of the interruption which it creates. Great variations are observable in the duration of pots from different makers, and even in those by the same maker; arising not so much from difference in the materials employed, as from a difference of skill or care in mixing the ingredients, and in the other parts of the manipulation. Whenever a bubble of air is left in the clay after being tempered, a pin hole in the pot made of such clay will be the common result, for the pressure of the melted metal will probably force a way through this weak part.

In order to submit the pots made by Mr. Smith to a very severe trial, one was kept constantly in work for two days and the intervening night; during which time it received twenty-three charges, of 70 lbs. each, of cast iron. Another pot was worked for three successive days, being raked at night in order to prevent it from cooling; under this management it received eighteen charges of cast iron, of the same weight as the former.

Neither of the pots had cracked or leaked in the least, but were now become unserviceable from the lip having been worn down into the side, in consequence of the necessity of knocking away the scoriæ after each fusion, which could not be done without breaking down a little of the lip.

The pots made by Mr. Smith are composed of the three following ingredients:—Stourbridge clay, coke, and plumbago, or black lead, as it is usually called.

Stourbridge clay comes to market either ground or in lump; the price charged for each is the same, and therefore the latter is to be preferred, as less mixed with impurities. A convenient quantity of this clay is to be put on a sieve $\frac{1}{4}$th of an inch in the mesh, and is to be carefully hand-picked, all pebbles and other impurities being thrown aside; it is then sifted on a board and put into a bin. Those pieces which will not pass through are transferred to a mortar with a spring pestle, in which they are pounded till they are fine enough to pass through the fine sieve, the meshes of which are $\frac{1}{8}$th of an inch wide. This fine clay is put in a barrel by itself.

The coke is thus prepared:—the masses, in the state they come out of the oven (for gas coke is of inferior quality,) have their tops and bottoms knocked off; the middle part only, which is of a uniform firm texture, being reserved for use. The coke is now to be pounded, taking care so to manage, by moderating the blow of the pestle, that as little dust as possible may be made. When duly pounded, it is to be thrown on the fine sieve, and all that passes through is to be rejected; it is then to be transferred to the coarse sieve, and what comes through is now of a proper size.

The plumbago is Mexican, and is to be reduced to a very fine powder.

The board called the *walking* board, on which the mixing and tempering the ingredients is performed, is six feet square, having cross pieces on the under side to raise it about an inch from the ground. The process commences by mixing on the coarse sieve eight quarts of clay and five quarts of coke, and sifting them together on the walking board; here they are to be still farther mixed by hand, till the mass appearing uniform, it is to be collected in a heap: *clean* water is then to be added and stirred in, so as to make the mixture of the consistence of mortar. One treader, or, for expedition sake two, is then to get on the board, and is to tread the mass well with his naked feet, working it chiefly with the heels: when trodden, it is to be turned over, or thrown with a spade, and is again to be trodden, alternating these two processes for about twenty minutes.

Then mix on the fine sieve four quarts of finely pounded clay, and 2 lbs. of the pounded plumbago, and sift a little of it over the mixture on the board; tread and throw it as already described, then sift on more of the fine clay and plumbago; and proceed in this manner till the ingredients are thoroughly incorporated, and the air has been all trodden out. The mixture should remain a night in lump, and the manufacture of melting pots from it may begin the next morning.

The apparatus consists of a four legged board, called a horse, for the workmen to sit on, having near its fore end two uprights supporting a cross board, through which a round hole is made, capable of receiving the stem of the plug or core. Perpendicular to this hole is a socket for the reception of a pin that terminates the stem of the core, and tends to keep it upright and steady; the core, fixed on the top of the stem, and therefore an inch or two above the cross board, is a cone as large as the cavity of the melting pot, with a border below to regulate the thickness of the pot. The best dimensions for the horse are 3 feet 6 inches in length, 9 inches in width, and 3½ inches in thickness: it should be raised sufficiently high to allow the workman to sit on it with his feet resting on the ground, and the part where the thighs press should be rounded off and curved in a little. The cross board, which receives the stem of the core, should be raised 6 inches above the horse; and upon it is erected the square or gauge, 18 inches high, and 10 inches in the blade. The cap of the core should be of basil or thin sheep skin.

Every thing being ready, the core is first to be rubbed well with plumbago, to prevent the cap from sticking to it; the cap is then to be put on the core, and a piece of the mixed materials, or *walk*, as it is technically called, large enough for the melting pot, is to be cut off from the mass. A pot capable of holding 70 lbs. of cast iron, requires 16½ lbs.; one of 35 lbs. of brass, requires 10 lbs. The piece is to be worked and beaten up well on the walk board, and is to be carefully made into a lump, which, a hole being then made in it, is to be fixed on the top of the core. The workman then takes a flat piece of board 4 inches square, with a handle, called a *flatter*, and strikes it, beginning at the top and bringing down the clay gradually till it has got as low as the rim at the bottom of the core. During this, the stem of the core being grasped by one hand and turned gently round, the core itself, with the clay on it, is brought successively under the action of the flatter. Great care is to be taken during this operation, that no air gets into it, or, if any bubble should appear in the clay, it is to be cut out with a knife. The bottom of the pot is now to be beaten quite flat, making it of the proper thickness by the gauge, and observing that the core is not made to rise from its socket by any clay getting under the bottom of the core; for the consequence of this would be, that the bottom of the pot, though regulated by the gauge, would be too thin by all the rising of the core. The workman now dips one hand in water, and presses the pot, rubbing it from top to bottom, while the other hand is turning round the core. The effect of this is, that the pot becomes of a uniform thickness, not varying in any part so much as one-sixteenth of an inch. Finally, the pot is to be smoothed all round as well as the bottom, and the process is completed. The first pot of each day's work should be cut up with a knife to ascertain that there are no air holes, and that the tempering has been properly performed.

A soft, new made pot, might get out of shape by being handled; the core, with the pot on it, is, therefore, taken off the horse, and carried to a quiet sheltered place, and the pot being then set on its

bottom, the core is raised out, leaving the cap within, which itself parts from the pot with a little management. The lip is then made by pressing the handle of the trowel from within against the edge of the pot, having placed the fore finger and thumb, one on each side of the edge, to limit the action of the pressure.

It is by no means an unnecessary precaution to put the new made pot in a quiet place, for if subject to any considerable jarring before it gets dry and hard, the pot will sink and not carry its rated charge of metal.

From twenty to thirty-six melting pots, of excellent quality, may thus be made in a day.

Report on Fulminating Powders capable of being used as priming for Fire-arms. By Messrs. Aubert, Pelissier, *and* Gay-Lussac.

[From Annales de Chimie, xlii. September 5, 1829.]

A great number of powders which fulminate by a blow are known; but, with respect to their application to fire-arms, those of chlorate of potash and fulminating mercury alone deserve particular attention, the others presenting too many inconveniences or dangers in their preparation and employment.

Powder with Chlorate of Potash.

This powder is an intimate mixture of sulphur, charcoal, and chlorate of potash. The sulphur or the charcoal may be suppressed on substituting other inflammable substances; but the powder then loses more or less of its power. At the suggestion of Berthollet, the discoverer of chlorate of potash, the manufacture of this powder was begun, 1786, at Essone; but an explosion, followed by the most serious accidents, soon occasioned it to be given up. This powder is stronger than the best powder made with saltpetre. It speedily renders the trial mortar unserviceable, by enlarging the chamber and producing deep cracks in it. Employed by M. Welter, at Meudon, to fill bombs which he caused to explode buried in the earth, it constantly broke them into uniform pieces of the size of a chesnut, whilst the pieces of other bombs, filled with common powder, and placed in the same circumstances, were much less numerous. This powder might, consequently, be employed with more advantage than common powder, for filling bombs, forcing gates, blowing up bridges, &c.

The property which it possesses of being inflamed by a blow or stroke, determined its application, as priming, to percussion guns; but it soon gave place to fulminating mercury, on account of several inconveniences attending it, the principal of which are, to cause great foulness, and to have a corrosive action on iron. As this last property might depend on the sulphurous acid produced during its decomposition, we endeavoured to neutralize the effects of the acid, by mixing with the powder suitable quantities of dried carbonate of soda. The experiment had the desired success; but the powder

lost, by this mixture, much of its inflammability, and, besides, we soon discovered that the chloride of potassium, resulting from the decomposition of the chlorate of potash during inflammation, speedily corrodes iron in a damp air. This is a great inconvenience inherent in powder made with chlorate of potash, and it does not appear to us to admit of an easy remedy.

We think it useless to insist any longer on the qualities of this powder, the use of which is discontinued, and shall confine ourselves to say that, if it were determined to employ it in the artillery for some particular purposes, the manufacture and carriage of it might, with suitable precautions, be effected without danger.

Howard's powder, or fulminate of mercury.

This powder is at present generally employed for the guns of sportsmen, on account of its easy inflammation, and its inaction upon iron. It is a salt formed of oxide of mercury, and a peculiar acid composed of one atom of azote, one of oxigen, and two atoms of carbon. Since the composition of this powder has been known, it has been named *fulminate of mercury.* When it detonates by a blow or by heat, the mercury is set at liberty in the state of vapour, as well as the azote; and, from the carbonaceous deposit observed on the surfaces on which it has been made to detonate, it is very probable, that half the carbon which it contains, forms, with the oxygen, carbonic acid, and that the other half is deposited or dispersed. In this supposition, 1 gramme of fulminate of mercury would give 0.155 litre of gases permanent at the temperature of melting ice, and under the pressure of 0.76 metre; but this volume, at the moment of explosion, is much more considerable, because it is dilated by heat and mixed with mercurial vapour. A gramme of common powder yields nearly a double volume of elastic fluids.

The revivification of the mercury in a state of vapour would be a very serious inconvenience, if the fulminating powder used for priming were in greater quantity than that now employed; because the mercurial vapour is disagreeable to the smell and injurious to health. Sportsmen, it is true, have not yet made any complaint of this inconvenience, but it exists, nevertheless; and before adopting into the military service fulminating priming powders, it would be prudent to examine them with respect to the influence they might exert upon the soldier in consequence of the inconveniences just mentioned.

Detonation of fulminate of mercury by a blow.

We shall examine this property, the fulminate being either perfectly dry, or very damp.

The fulminate, when dry, detonates very readily, by a *blow* of iron upon iron, a little less readily by a blow with iron upon bronze, still a little less by that of marble on glass, marble on marble, or glass on glass: it inflames, however, with sufficient facility in these different circumstances, for us to be almost sure of causing the explosion at every blow. The blow of iron upon lead inflames it but with great difficulty, and that of iron upon wood is quite ineffectual.

The fulminate always inflames easily by *friction*, especially by that of wood against wood. It detonates less readily by that of marble on marble, than of iron upon iron, and, lastly, of iron upon wood or marble. The fulminate which has been pulverized detonates with more difficulty, particularly by friction, than that which is in crystals.

Moistened with five per cent. of water, the fulminate loses a great deal of its inflammability. It detonates, however, with the blow of iron on iron, but the portion struck burns alone and without flame, without communicating the inflammation to that which is not struck. The friction of wood upon wood produces a similar effect. But inflammation was not produced in the experiments by the blow of marble on marble, nor by the friction of marble on marble, or on wood. The fulminate, inflamed by a heated body, melts with the same slowness as common gunpowder moistened with fifteen per cent. of water.

If the fulminate be mixed with ten per cent. of water, it will be still more difficult to inflame it. It disappears, however, by a blow of iron upon iron, but without flame and noise. The part struck burns alone and projects the other. Moistened with thirty per cent. of water, it still sometimes detonates under the mullar, (wood on marble) during the manipulations; but the detonation is partial, and is not communicated to the rest of the mass: the mullar is merely raised under the hand of the workman, and no accident ever results from it. These experiments afford the certainty, that by operating on the fulminate mixed with water, explosions will be little to be dreaded.*

Effect of the explosion of the fulminate of mercury.

The character of the powders eminently inflammable, is to detonate at the moment of their inflammation, even when only very small quantities are employed, and to act on surrounding bodies as a moving power actuated by a great velocity. The best made common powder is extremely far from having such a rapid inflammability as fulminate of mercury, and especially as fulminate of silver; and no fire-arms loaded with either of these fulminates, with the same charge as common powder, can resist their action, although the volume of elastic fluids produced in the first case is smaller than in the second.†

* According to the new arrangements adopted in the manufactory of priming powders, situated in the plain of Jory, near Paris, since the explosion which entirely destroyed it, more than two hundred millions of caps have been manufactured in that establishment, without any other accident than a piece of marble broken under the mullar, as above mentioned.

† Whatever charge of the fulminate of mercury may be put into a fire-arm made with the known metals, it will speedily be destroyed; for, during the charging of the primings or matches with the fulminate weakened with common powder, the punches of tempered cast steel, with which that powder is pressed to the bottom of the capsules, are speedily furrowed by the explosions which occur every moment, although the gases produced have a free passage by the sides of the punches.

Thirty grammes of fulminate of mercury inflamed in a small box of card, on the head of a barrel standing loosely, made a hole through it without breaking it, as a ball would have done from a four pounder. The noise of the explosion seemed much louder than the report of a musket.

The same quantity of powder, inflamed in similar circumstances, made scarcely any report, did not break the bottom of the cask, nor did it even shake it.

Twenty-five grammes of fulminate of mercury put on a board placed upon the ground in the open air, broke it to pieces, and besides made a hole in the ground under the board. The same quantity of fulminate, placed on a barrel with the head out, of the capacity of a hectolitre, nearly (= 3½ cubic feet,) broke it to pieces by the detonation.

A small steel chamber three cubic millimetres in capacity, the sides of which were three millimetres in thickness, was often broken to pieces by the explosion of the fulminate of mercury which it contained.

Twenty-five grammes of fulminate of mercury, inflamed in the open air, communicated the inflammation to another portion of fulminate placed five centimetres (= 1.97 inch) off; but inflammation did not take place in another portion of fulminate at the distance of twelve centimetres (= 4.72 inches.)

If we place a train of it against another train of gunpowder on paper, and even one upon the other, and set fire to the fulminate, the gunpowder will be dispersed without leaving a trace of its combustion on the paper, and it may be found again almost entirely. If, on the contrary, we set fire to the gunpowder, as soon as the inflammation reaches the fulminate, the latter so instantaneous in its detonation, will still have time to disperse the rest of the powder before the inflammation can reach it, and no traces of the combustion of the dispersed part will be perceived. An intimate mixture of fulminate and of bruised gunpowder will, on the contrary, burn totally.

This result on the propagation of the inflammation by the fulminate, to such small distances, in open air, appears so much the more extraordinary, because, in the primings of fire-arms, this propagation, relatively to the quantity of fulminate, is incomparably greater, since it extends to more than a centimetre (= 0.39 inch,) and lieutenant colonel Châteaubrun has carried the inflammation to the powder, in a twenty-four pounder, through the thickness of the metal, by a chimney of ten points with ten centigrammes (= 1½ grain) of fulminate. But the results above stated are incontestible, and it will soon be seen that the anomaly which they present is not real.

[TO BE CONTINUED.]

Instructions relative to the Art of Refining; two memoirs published in 1827 *and* 1828. *By* M. D'Arcet, Assayer of the Mint, Paris.

The art of refining is that of separating gold and silver from metals

of less value, with which they are combined. It has been practised from the earliest periods of the metallurgic arts.

The method formerly used was to melt the ingot of metal to be refined, with saltpetre, in order to separate the oxydable metals. It was then converted into grains, which were heated in earthen vessels, at first with weak nitric acid, and in a second operation with that which was more concentrated. The gold alone remained undissolved. It was collected, washed, dryed, and then melted with saltpetre. The acid liquids united, were placed in contact with plates of copper, which separated the silver entirely, which being washed, was melted with saltpetre and borax. The liquid nitrate of copper was evaporated, and then exposed to a heat capable of decomposing it. The oxide of copper was reduced by charcoal in an air furnace. In this operation the nitric acid, which is very expensive, was almost entirely lost—a great deal of saltpetre was used—the vessels employed were often broken, as they were unfit to resist the great variations of temperature to which they were exposed—deleterious gases and vapours were copiously produced—the waste was very great—and considerable expense was incurred in reducing the copper.

In the new process, nearly all these inconveniences are avoided. The ingot is melted and granulated without saltpetre—the grains are treated with sulphuric acid in large vessels of platina, at a high temperature, by which the silver and copper are dissolved. The gold being thus separated from the silver, is treated with fresh acid, then washed, dried and melted with a little saltpetre. The sulphate of silver is decomposed by plates of copper aided by heat, and the silver is washed, dried and melted with a little saltpetre and borax. The solution of sulphate of copper is saturated by adding oxide of copper, then evaporated and crystallized. In this process much labour is saved, and less expense incurred in saltpetre, acid, crucibles and charcoal; there is less waste, and the amount of saleable products is greater,—while, no other gases being disengaged than sulphurous acid with a little sulphuric, the operations are performed with less injury to the workmen.

The alloy most easily refined by sulphuric acid, ought, in general, to consist of gold, silver and copper, in nearly the following proportions.

Silver, - - - -	725
Gold, - - - - -	200
Copper, - - - -	75
	1000

If the proportion of copper be much greater than the above, anhydrous sulphate of copper will be held in suspension in the solutions which prevents the gold from separating easily; and if the gold be in greater quantity, the alloy is not easily attacked by boiling sulphuric acid; the refiner should therefore previously analyze a small portion of the ingot, and add to the melting mass, some silver or copper, as the case may require.

If lead, or other base metal than copper, be present, it must first be separated, either by saltpetre or by cupellation.

Refiners, in general, employ 3 parts of sulphuric acid (sp. gr. 1844) for 1 part of alloy, of the foregoing composition,—varying the quantity of acid, however, with that of the relative proportion of gold or copper. The acid should be free from nitric or hydrochloric acid.

The only precaution requisite with respect to the copper, is, that it be free from lead or tin, as these metals form, with sulphuric acid, insoluble compounds, which would remain mingled with the silver. In general it requires 28 parts of copper to precipitate 100 of silver, and this furnishes from 100 to 104 parts of crystallized sulphate of copper.

The *platina boilers* employed at Paris, were constructed by M. Bréant. They hold about 11 gallons, weight 18 lbs. and cost 8500 francs. They are surrounded by an iron defence, which serves to transport them, and prevent injuries. Fine gold, at the moment in which it is separated from the alloy, by sulphuric acid, is in very fine powder, which coming in contact with the platina, under the influence of boiling acid, is easily soldered to the platina, and requires to be detached from time to time, by the action of a little weak aqua regia, which dissolves the gold without attacking the platina.

[*Bib. Univ. Avril*, 1829.

On the Elastic Force of Vapour at high Temperatures.

A committee, appointed by the Academy of Sciences, has been engaged in carrying on experiments to determine the elastic force of vapour at high pressures: the labours have principally devolved upon MM. Dulong and Arago. The results have been obtained experimentally up to 25 atmospheres, and extended to 50 by calculations. That no error dependant upon the use of valves should interfere, it was resolved to estimate the force exerted by the columns of mercury sustained. A glass tube was therefore prepared by MM. Thibaudeau and Bontemps, consisting of 13 pieces, 2 metres (78.74 inches) each in length, 5 millimetres (0.2 of inch) in diameter, and the same in thickness. Each piece was sustained by counterpoises, so that the lower should not be crushed by the upper, and the whole was erected in a square tower, which is the only remains of the ancient church of St. Genevieve.

Fearing that if the steam from a boiler were made to act directly upon such a column of mercury as this tube would sustain, it might, from intermission of its force, occasionally produce such sudden agitation in the metal as to endanger the safety of the whole, it was resolved to form a kind of manometer, in which the compression of a given volume of air should be ascertained, first, by the column of mercury, and afterwards used as a measurer of the elasticity of vapour at various temperatures. In this way the estimations would be as accurate as if made directly by the column of mercury. The

preparation of this instrument gave an opportunity of examining the law of Mariotti, namely, that all gases are compressed in volume in proportion to the energy of the compressing force. Boyle and Muschenbroek thought they saw errors in this law, even when the force was not above 4 atmospheres. Robison and Sulzer carried the force to 8 atmospheres, and agreed in giving the same departure from the law, namely, that when compressed eight times, instead of exerting a force eight times that of the common air, it was only six times greater. Oersted, on the contrary, found the law true to 8 atmospheres, and even up to 60 atmospheres; but this mode of experimenting is not satisfactory to the French commissioners, though the results were correct.

In the preparation of the manometer the experiments were carried to 27 atmospheres, and the law found to be *correct.* It was intended to ascertain if it held good with other gases than air, but the authorities forbade the use of the old church tower for this purpose.

There appears to have been much fear about steam at the pressure of 24 or 25 atmospheres; and, lest the boiler should explode, and blow up the old vaults, and even destroy neighbouring buildings, it was determined to have it in the court-yard of the observatory, and make the experiments there. Ultimately, therefore, the manometer was transferred, though with great difficulty, and finally placed in proper communication with the boiler.

Some important precautions were now taken to ascertain the temperature accurately. The first was to take account of the cooling effect of the air on that part of the thermometer exterior to the boiler; this was done by retaining it constantly at the same temperature. The next was to prevent alteration in the capacity of the bulb, by allowing the vapour to press upon it. This was effected by putting the thermometers into gun barrels, made thin, closed at one extremity, and filled with mercury; these, when fitted to the boiler, were made to descend, one to the bottom of the boiler nearly, to give the temperature of the water; the other to within a few inches of the water, to give the temperature of the vapour.

The temperature and pressure were then experimentally ascertained up to 24 atmospheres; after which formula was sought for, by which they could be extended to higher pressures, and the following one adopted:

$$e = (1 + 0.7153\ t)^5$$

e being the elasticity; t the excess of temperature above 100° C, taking for unity 100° of the centigrade thermometer. This formula nearly represents the results given by experiment up to 24 atmospheres; the greatest error has been at 8 atmospheres, and was then 0.9 of a degree. It was more accurate for the higher pressures, being calculated from them, and the commissioners have no doubt that at 50 atmospheres the error is not more than 0.1 of a degree.

Elasticity of the Vapour taking the Pressure of the Atmosphere as Unity.	Temperature. Centigrade.	Fahrenheit.
1	100.	212.
1½	112.2	233.96
2	121.4	250.52
2½	128.8	263.84
3	135.1	275.18
3½	140.6	285.08
4	145.4	293.72
4½	149.6	301.28
5	153.8	308.84
5½	156.8	314.24
6	160.2	320.36
6½	163.48	326.26
7	166.5	331.70
7½	169.37	336.86
8	172.2	341.96
9	177.1	350.78
10	181.6	358.88
11	186.3	367.34
12	190.0	374.00
13	193.7	380.66
14	197.19	386.94
15	200.48	392.86
16	203.60	398.48
17	206.57	403.82
18	209.4	408.92
19	212.2	413.96
20	214.7	418.46
21	217.2	422.96
22	219.6	427.28
23	221.9	431.42
24	224.2	435.56
25	226.3	439.34
30	236.2	457.16
35	244.85	472.73
40	252.55	486.59
45	259.52	491.14
50	265.89	510.60

The members of the committee remark, that they could find only one English table of the force of high pressure vapour; it had been given to M. Clement by Mr. Perkins, but it was found sadly erroneous: for instance, at the temperature of 215° C. or 419° F. the force in it is given as 35 atmospheres, whereas it is really only 20, or little more than one-half. In Germany a table has been constructed by M. Arzberger, of Vienna, which rises to 20 atmospheres, and is much nearer the truth than Mr. Perkins'. It is about 3 atmospheres wrong at the highest pressure.

[*Bib. Univ. and Silliman's Journal.*

Description of an improved mode of making Lithographic Transfers. By J. Netherclift.

Lithographic drawings were originally made with a peculiar ink, on paper covered with a coat of size, and were then transferred to the stone by warming this latter, laying the drawing on its face downwards, and passing both through a rolling press. Hot water, by means of a sponge, or in any other convenient way, was then applied to the paper, till the coat of size on which the drawing had been made was reduced to a soft, pulpy state, which allowed the paper to be stripped off, leaving the drawing fixed, by the previous pressure and heat, to the face of the stone.

Many advantages attended this original method, compared with that which has now nearly superseded it, namely, making the drawing on the stone itself; for, in this latter mode, the artist works on a cumbrous, unportable slab, and is obliged to make his drawing in an inverted position; whereas, by the use of prepared paper, he had a light and portable material, together with the great advantage of making his drawing in a natural position, which, being that to which artists are accustomed, the work was free from stiffness and constraint.

The objection to the method by transfer, was, that the lines were coarse, and only adapted to free sketches, being deficient in that fineness and precision required in most works of art, especially those intended for illustration of objects of natural history, or as specimens of the higher department of art. The drawings of all such objects are made on the stone itself. The Society of Arts, conceiving that it would be a great point gained so to improve the ink and paper, and generally the whole method of making lithographic transfers, as to render it applicable to most of the purposes for which drawing on the stone is now had recourse to, offered a premium for this object, which was successfully claimed by Mr. Netherclift. The society do not suppose that Mr. Netherclift's process is incapable of improvement; but, from the specimens produced before them, and from the unanimous testimony of several very competent judges, they believe that the process which they now make known will be found to produce work of a very superior quality to the lithographic transfers which have hitherto come under the notice of the public.

Composition of Materials.

The transfer paper is thus made:—

Take the proportions as follow:—A quarter of a pound of tapioca and arrow-root; boil them separately into a paste, and then unite them, and pour sufficient hot water to make the whole a thin paste, which must be strained through a muslin rag: add to the above a quarter of a pound of flake white, previously well ground in water, and stir it in with the paste. The paper, either thick or thin, should be rather porous, or what is called half-sized paper. First, with a flat camel's-hair brush lay a coat of common size on the paper, and let it dry in; then lay on the paste in the most careful and *even*

manner *thrice* following, but dried between each time of laying on. Thus the whole surface will be properly covered: if there should be any part omitted, the work on it will be imperfect. As soon as the paper is dry, it should be either well *cold pressed*, or sent to the glazing-mill and flatted between iron rollers, which clears the surface, and the glazed part should be on the back side of the paper, which is done by rolling two sheets together face to face. The work on the paper is, if fine, executed with a steel pen, as the specimen herewith sent, the dark parts with a common crow-quill.

The ink is composed of equal quantities of yellow soap and shell-lac, boiled and burnt together, with lamp-black sufficient to make it black, which forms a cake, to be rubbed up, as Indian ink, with warm or cold water. I prefer to use no tallow or bees'-wax, and am prepared to show that the art of lithography, as connected with ink-work, is not founded on the opposite qualities of acid and grease; for the above ink requires no acid to neutralize the alkali of the soap, the grease of which is fixed by the extreme quantity of shell-lac; thus the acid is avoided, and the lines are not so liable to be injured. In extreme cases, however, where a mass of shade is condensed, a little acid may be used with effect. Niric acid, diluted with water, is the proper article.

The act of transferring is easy:—Let the stone be moderately warmed; damp the back of the paper on which the work has been executed till it lies perfectly flat; take care no *wet* touches the work; lay the paper carefully on the warm stone, and on it lay flat soft paper, which will absorb the wet on the back of the transfer paper. Pass it through the press three or four times with increased pressure, after which this paper will peel off, leaving the composition as well as the drawing on the stone. Wash off the former, and rub the drawing over with a strong coat of gum-arabic water. Lay it by till cold, and print. [*Register of Arts.*

On the so termed French Glass-Paper, and a substitute therefor. By Thos. Gill, Esq.

We have received from France, of late years, thin transparent sheets of this substance, and which have been found by artists to be greatly preferable to any tracing-paper hitherto employed by them. It is evidently a preparation of gelatine, most probably, bone-glue, and seems to have been formed by pouring a solution of it upon plates of polished glass, and leaving it to become dry. We are not aware that it has hitherto been prepared in this country.

Mr. W. Kelsall, the ingenious engraver, whose method of taking casts of medals in plaster of Paris has been given in the Technological Repository, has, we are informed, employed this glass-paper, in making tracings, in the following novel manner. He places it upon the original design which he wishes to copy, and to transfer, in a reversed position, to the surface of the etching-ground, laid upon his copper or steel plates; and, with a fine etching-needle, and light

and even strokes, he draws the outlines of his subject upon the surface of the glass-paper. This done, he rubs over it some patent calomel, which enters into and fills up the lines so drawn; the remainder being carefully removed from the surface of the glass-paper. He then places the surface of the glass-paper thus treated in contact with the etching-ground, and secures it from slipping; and then, by dexterous light blows upon its opposite surface, he transfers the calomel from the slight incisions made in the glass-paper, to the etching-ground upon his plate.

This material, although excellent for the purpose described in the foregoing account, being, however, scarce and expensive, the editor thinks it will be acceptable to artists, to be informed of other means of procuring similar, and even more important, results.

Many years since, a person submitted to the Society of Arts, a method of drawing perspective representations of objects, and of transmitting them to the surface of paper. His method consisted in coating the surface of a piece of plate-glass with a solution of gum arabic, and letting it become dry. This glass he then mounted perpendicularly, by placing it in a groove made to receive it in a wooden basis, and which also carried a sliding arm, which supported a metal plate, having a small orifice in its centre, to serve as an eye-piece. The outlines of any object were then to be traced upon the gummed surface of the upright glass, with a fine needle, fixed in a proper handle; the eye of the artist being at the same time applied to the orifice in the eye-piece; and thus a perspective outline of the object might be readily drawn in the thin coat of gum. The glass plate being removed from its stand, the lines traced in the gummed surface were then to be filled with copperplate printing ink, which was wiped off the surface as usual. A moistened paper being then laid upon the inked surface, the outlines might be transferred therefrom to the paper, by burnishing the back of it with any proper and smooth instrument. The editor put this method to the proof, and thus obtained the outlines of the object he drew upon the gummed surface of the glass, transferred upon the paper. The success of the experiment was not, however, sufficient to merit the reward of the Society.

Now, he would suggest, that a thin plate of glass, coated either with a solution of gum arabic, or with a mixture of gum arabic and isinglass, or simply with one of isinglass, might be substituted for the French glass-paper with every prospect of success; and the outlines of any object traced upon it, might be filled with calomel, be reversed, and transferred to the surface of the etching-ground, in the manner done by Mr. Kelsall, and as above described; and when done over with, a fresh coat of gum, &c. would render the glass again fit for service.

We also think that a thin plate of lantern-horn might be conveniently employed as a substitute for the French glass-paper, and at a much cheaper rate; although it would not possess the great advantage of the capability of being used repeatedly, which the prepared glass plates do. [*Tech. Rep.*

Some account of the Oil expressed from Cotton Seed; extracted from a letter addressed by Gen. D. R. Williams, *of South Carolina, to* Messrs. Follet *and* Smith, *of Petersburg, Virginia.*

We have previously given some account of the patent obtained by Mr. Francis Follet, for a machine for hulling cotton seed, and also of some improvements subsequently made in that machine by himself and Mr. Jabez Smith. The object of hulling is to get rid, not merely of the hull, but of the fibres of cotton which adhere to it, and which would absorb and retain a large portion of the oil, under the press. When it is known that the seed weighs about three times as much as the cotton which surrounds it, an estimate may readily be made of the immense produce of this article in the southern states. Not long since, those who had cotton gins, felt themselves obliged by any neighbour, who was willing to take the seed away, and what might have produced *millions* of dollars, has been rejected as of no value. We sincerely hope that Mr. Follet may at length be remunerated for the series of sacrifices, and the indefatigable exertions which we are aware he has made, and that he may have the gratification of knowing that he has become the founder of a manufacture of great national importance. Of this gentleman we have no personal knowledge, but are sufficiently acquainted with the history of his machine, and so well convinced of its real value, as to feel a high degree of interest in the general introduction of the one, to the great benefit of the other. [Editor.

Society Hill, 13*th May*, 1830.

Gentlemen—Your favour reached me in due course of the mail. I have not replied earlier, because as our oil mill was so nearly finished, I preferred to delay the acknowledgment, till I could speak from facts, resulting from my own experiments; and although these have not been carried out as far as I propose, they are quite enough so to satisfy my own mind fully. In relation to your "cotton seed huller," I am gratified to be able to say, it performs all that you have promised for it, and is, moreover, most easily comprehended; ours has been set up and put into operation by persons who never saw one before. Our oil mill is after the Dutch mode, of pestle and wedge. Our grinding stones are not quite four feet in diameter, and 12 inches thick. The cotton seed kernels are so much easier to grind than flax seed, these stones, small as they are, may easily grind for two pair of pestles and wedges. That the whole process is simple and not difficult to understand, you will infer, when I tell you, that no person concerned about ours, except myself, has ever seen an oil mill before. You are aware that I attempted last winter to enlist the public generally in favour of your invention, by a few pieces in the Columbia Telescope, signed "a Cotton Planter." These were founded on information, with which I had been favoured. You may be certain of the satisfaction I feel in having tested by actual experiment, that all those statements were perfectly correct. In rela-

tion to the uses to which cotton seed oil may be applied, it is almost superfluous to include *painting*, as that fact is fully settled: the same process which is indispensable to make flax seed oil dry, produces the same effect with this. There are good judges who pronounce it to have a better body, and to be, therefore, superior: considering to what extent the adulteration of linseed oil has been carried, owing to the decrease of material, it is not hazardous to say the cotton seed oil *ought* to be preferred. Without resorting to any of the patented methods of refining oil, I have succeeded, by a simple and cheap process, in refining ours, so as to answer all the purpose of the best sperm. oil, in our cotton factory. Our superintendent, Mr. Hopkins, has been very careful to compare it with as good sperm. oil as I ever saw, and is entirely satisfied of its equality with it. In its present state, we find it burns very well by a little attention to the wick; by other means than those I have as yet used, I am satisfied it will be much superior to the best animal oil for lamps, it being entirely inoderous, a circumstance of great importance in establishments requiring a great many lights. The residue of the kernels, after the oil is expressed, called oil cake, is excellent for stock generally; particularly for milch cows and pigs. If your invention could do nothing more than to convert cotton seed into wholesome food for stock, it would still be, in my opinion, of infinite importance to the whole southern country. The planter who makes four bags of cotton to the hand, will now, with your aid, have, in addition to his grain, forty bushels of good food also per hand, more valuable than that quantity of oats. In New England it is preferred, pound for pound, to oats. No man is so dull, as not to see that the consequence to his *people* and his *purse*, must be alike agreeable, it being a self-demonstrable proposition, that there is no scarcity, where milk and pigs are abundant.

The only use to which cotton seed was applied, previously to the invention of your hulling machine, was for manure. The same quantity fed to stock may, with the ordinary care that every planter is competent to bestow, elaborate ten times the quantity. Thus much for facts: you will not consider me an enthusiast, when I add, I have not the slightest doubt, that the time will come, when, owing primarily to your invention, cotton seed oil will also enter largely into the food of man. From these considerations, I earnestly hope you may receive a very handsome remuneration for your discovery; more you ought not to ask. Do not, like Miller & Whitney, attempt to "kill the goose for the golden egg." A fair price the community will be willing to give, more will produce for you trouble, vexation, and probably defeat. Let me also advise you not to despair of a just reward, because it may be slow to reach you. All communities change their habits slowly; ours is at present prejudiced against inventors. My best days have been spent in attempts to improve the agricultural and mechanic arts; except a few implements of husbandry, I have no reason yet to believe I have in its opinion added any thing to society, but in two instances. I was the first person who attempted the use of mules, certainly in the South-

ern states, if not in the United States, for the purpose of agriculture. If I had then been as easily laughed out of countenance, as most young men, I should have given it up in despair, for I was ridiculed by old and young. I have lived to see the only limit to their use, is, the circumstances of the planter. I first attempted to dam out the inundations of the Pee Dee, and consequent thereon had well nigh been deprived of a seat in congress, because it was thought, any man who believed "he could keep the fresh from his low grounds, was too big a fool to go to congress." Now there is nearly as much swamp lands reclaimed from freshets in South Carolina, as on the Mississippi. These facts may serve to encourage you, for however slow the community may be in giving its confidence, it does not always refuse it.

Respectfully yours,

David R. Williams.

Test of the Strength of Chlorine, or Chloride of Lime.

The solution of indigo, which has long been employed in estimating the quantity of chlorine in any fluid, is found to be uncertain, or at least inconvenient, on account of the variable quality of indigo, and also of the changes of colour which a dilute solution of indigo in sulphuric acid spontaneously undergoes. If the solution be concentrated, the sulphuric acid expels the chlorine too rapidly from its solution, and thus prevents a portion of it from reacting on the indigo. *Muriate of manganese*, proposed by *A. Morin*, is a more certain and preferable test. He has been able to appreciate the half of a hundredth part of chlorine by this reagent, and nothing is more easy, he remarks, than to prepare it in determined proportions, and to preserve it unaltered for a long time. To prepare this chlorometric fluid, it is sufficient to dissolve some oxide of manganese in hydrochloric acid, taking care to have an excess of the oxide. Filter the liquid, which is of a pale rose colour, and scarcely reddens litmus. A single drop of a weak solution of subcarbonate of soda, produces in it a white precipitate, which does not disappear by agitation. These characters indicate that the saturation is sufficient. In this state, the solution of muriate of manganese is precipitated, of a deep brown, by the chloride of lime; the oxide being set free by the union of the muriatic acid with the lime, which the chlorine kept in suspension. It is obvious that the solution of the chloride contains lime foreign to its own composition, only in the state of muriate, of chlorate, or of lime water. Now the muriate and chlorate of lime give no precipitate with muriate of manganese; lime water it is true yields a brownish colour, but this proves to be of no importance, for on decomposing muriate of manganese, by equal volumes of lime water and solution of chloride reduced to 14°, more than 100 parts of hydrochlorate of manganese were necessary for the chloride of lime, while less than one part was sufficient for the lime water.

The advantage which the solution of muriate of manganese offers as a chlorometric substance, are threefold.

1. The uniform condition of the test.

2. The disengagement of the chlorine is produced by an acid which acts only while the metallic oxide, with which it is combined, is precipitated.

3. The precipitation of the oxide, which indicates the quantity of chlorine, precedes the disengagement of the gas, or at most is simultaneous with it; whereas in employing a solution of indigo, the chlorine becomes at first free to react on the colouring matter, the destruction of which serves as the measure of its quantity. Hence the trial by muriate of manganese can be made slowly, and is consequently more certain. [*Bib. Univ. and Silliman's Journal.*

Blowpipe Simplified.

A modification of the blowpipe has been contrived by *M. Danger*, and is described in the Bulletin d'Encouragement, which has simplicity and cheapness to recommend it. A wooden clamp, with a screw underneath to attach it to the edge of a table, has a hole bored vertically through it in front, and to this hole underneath is attached a tube, to the other end of which a bladder is tied. Another tube, which terminates with a jet piece, is attached to the hole above. It is obvious that if this bladder be inflated, and its sides pressed together by the knees of the operator, or by any other means, a stream of air will issue through the jet, and maintain the flame of the lamp. To keep up the supply of air, a mouth tube is inserted into a lateral opening in front of the clamp, and which reaches upwards to a convenient height for the mouth. By blowing into this tube occasionally, the supply of air in the bladder is preserved, and to prevent its return, a valve is placed at the end of the mouth tube. This valve is simply a piece of cork, fashioned to a conical opening in a tin or brass piece adjusted to the end of the tube. A short wire, fastened to the cork, passes freely through a little guide, and is provided with a catch to keep it just within the conical opening. The mouth tube may consist of two pieces, one sliding into the other, so as to be readily adjusted to any convenient length. The lamp should be covered, when in action, with a hood having two openings, one in front for the admission of the blowpipe, and the other opposite for the exit of the jet of flame. The air may be forced out of the bladder mechanically, by surrounding it with a coarse net of twine, and hanging a weight to the bottom of it. This blowpipe unites great simplicity to cheapness and facility of adjustment. [*Ib.*

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

SEPTEMBER, 1830.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN MAY, 1830.

With Remarks and Exemplifications, by the Editor.

(Concluded from page 85.)

31. For a *Machine for Thrashing Rice;* Jehiel Butts, Georgetown, South Carolina, May 20.

It was the machine generally used for thrashing rice, which probably suggested the construction of most of our thrashing machines, the main acting part being a cylinder with beaters. In Mr. Butts' machine, two cylinders are used instead of one; these stand one over the other, the grain passing between them, and being therefore acted upon both above and below. The sheaves are opened, placed upon an inclined board, and pushed forward between the cylinders, which revolve with great rapidity. Revolving rakes then draw the straw onward over wire screens, which suffer the grain and chaff to pass through upon an inclined board, down which it is carried to a revolving fan.

That for which the patent is taken appears to be the two revolving beaters, striking the rice on both sides.

---

32. For an improvement in the art of *Manufacturing Seine Twine by Machinery;* The Petersburg Manufacturing Company, assignees of the inventor, Alston Pond, of Petersburg, Dinwiddie county, Virginia, May 20.

On the 21st day of April, 1829, a patent was obtained by Mr. Pond for machinery having the same object in view with the present;

this we noticed in due course. The machinery now patented acts somewhat on the same principle with the former, but appears to be more simple and compact. We shall not attempt to describe it, for the same reason which interfered with a description of the first machine, namely, that it could not be done without drawings. The claim is to the particular mode in which a double motion is given to the bobbins containing the yarn; that is, a horizontal motion to give the twist, and a vertical one to deliver the yarn to be laid.

The instrument is well described, and neatly and distinctly drawn; and we think the object of the patent clearly set forth.

---

33. For an improvement in the mode of *Making Pails, Tubs, &c.;* Palmer Phillips, Busti, Chautauque county, New York, May 20.

This patent is taken for a method of jointing the staves of tubs and buckets, so as at once to give the right slope, or cant to their edges. A trough is made in which the jointer is to be worked backwards and forwards by hand; the iron is on one side of this jointer, and placed obliquely. Through the side of the trough a long mortise, or slot, is made, to admit the edge of the stave to come in contact with the jointer. The stave is supported on two rests on the side of the trough, and flush with the lower edge of the slat. These rests are hollowed to receive the stave, and can be raised or lowered by means of a screw, to adapt them to the staves of vessels of different sizes. When properly adjusted, any number of staves may be jointed, and will come correctly together, whether narrow or wide. The claim is to the foregoing machine, which is very much like a common shooting board.

---

34. For an improvement, design, or plan, for the purpose of *Giving instruction in the valuable arts of Reading, Drawing, and Writing*, whereby persons of any age, but particularly children and youth, may be enabled to instruct themselves, as well as to be instructed by masters, or teachers, in those arts, called "Varlé's Self-instructor;" Charles Varlé, Baltimore, Maryland, May 20.

Numbers, pictures, and names, are engraved in columns, and printed on foolscap, or other paper; the arrangement being as here represented.

CIV. 104	hat.			Hat.
CV. 105	house.			House.

The child, or other pupil, is to be taught the figures and the words; is to write them in the blank spaces; is to pass a dry pen over the outlines of the drawings; and is then to draw them in the spaces left for that purpose.

This is very much like many of our primmers and spelling books, and still more like some of those prepared for teaching the deaf and dumb. The patentee has given particular directions for proceeding with his *discovery*, or *invention*, but has not told us in what part, or parts, the novelty consists, a task which, fortunately, we are not called upon to perform. If he is successfully employed in teaching, we wish him fame and fortune, as we honour his pursuit; but do not, however, anticipate that any large portion of this fortune will be derived from the sale of his patent rights, or patent books.

---

35. For an improvement in the *Piano Forte Action;* Charles Saltonstall Seabury, City of New York, May 20.

This patent is taken for a mode of applying the action above the strings, in the common horizontal piano forte. It is contemplated, however, to apply the same kind of action to the upright, and grand piano, and to other stringed instruments, and the claim is to the action generally.

Messrs. Loud and Brothers, of Philadelphia, obtained a patent for such an arrangement of the action of horizontal piano fortes as should cause the hammers to strike the strings in the direction in which they are supported by the bridges. This patent was obtained on the 15th of May, 1827, and the specification may be found at p. 62, vol. iv. first series.

If the Messrs. Loud can sustain their claim to the particular object which they specify, the claim of the present patentee will conflict with theirs, as one of the modes proposed by them was the placing of the action above the strings, without regard to the particular arrangement of the action in other respects.

The plan of placing the action above the strings, if our information be correct, has been followed in some of the German manufactories.

---

36. For a *Machine for Washing Clothes;* Andrew Kirkpatrick, Urbana, Champaign county, Ohio, May 21.

The claim is to a "curved bed and rubbers," applied in a way fully justified by prescription.

---

37. For an improvement in the *Plough;* Charles Rawling, Spring Mills, Centre county, Pennsylvania, May 21.

We are told that "the mould board is made of cast iron of a suitable curve," that "the land side is made of the usual form," "the share is made of wrought or cast iron," "the coulter is made of wrought iron, and of a *certain* curve to prevent its clogging," "the handles are made of wood, and of the usual shape." And the claim is to "the form of the share, and the manner in which it is fastened

to the mould board, by screws, bolts, and nuts, screwing on the lower side of the same." It is well to make ploughs of *suitable* and *certain* forms, and to employ the ordinary materials, as the present patentee proposes; the screws, bolts, and nuts, which screw the whole together, appear to form the subject of the patent.

---

38. For a *Machine for Washing Clothes;* James M. Gates, Norwich, New London county, Connecticut, May 21.

The patentee claims "the arrangement and putting together of the various parts which constitute the same in the [machine] above specified; and the application thereof, and the powers and principles embraced in the operation of said machine, in the form and method above set forth and described, for the purposes of washing clothes." We cannot tell, because we do not know, what are the new powers and principles intended, as they are neither well described or represented; the various parts appear to us like the parts of various other washing machines, excepting that the vibratory motion of the dasher is effected by means of ropes, in what appears to be a very inconvenient way.

---

39. For a *Machine for Cutting Paper, Books, &c.;* Francis B. Howell, Lockport, Warren county, New York, May 21.

This machine strongly resembles that patented by Mr. John M'Clintic, of Chambersburg, Pennsylvania, March 31st, 1827, which operates by bringing, by means of a lever, a straight knife or cutter down upon the ream of paper, &c. to be cut. In the present machine, instead of a straight knife, the one used is bent twice at right angles, so as to cut the three sides at one operation. The claim is to "the above described knife, containing three cutting edges, either stationary, or moveable."

We doubt the superiority of this to the former mode. It will be difficult so to form the knife as to make the corners of the paper perfectly sharp; and it will be still more difficult to keep such a knife in order; besides these objections, every particular size of paper must have its appropriate knife.

---

40. For an improved mode of *Laying the Foundations of Marine Rail-ways,* under water; James Ronaldson and John Lindslay Neill, Philadelphia, Pennsylvania, May 22.

(See specification.)

---

41. For *Making or Manufacturing Felt,* or a substance in nature thereof, applicable to covering the bottoms of vessels, and other useful purposes; Thomas Robinson Williams, of Newport, Rhode Island, now in London, May 22.

Different fibrous materials, such as hair, wool, cotton, hemp, flax, &c. are to be spread evenly upon a web of woven wire, by a card-

ing machine, blowing machine, picker, or any other means. This web of wire forms an endless apron, passing over rollers. Over this a second apron of wire is placed, which likewise passes over rollers; this latter apron is, however, much shorter than the former, the rollers being considerably nearer together. Between the upper and lower portions of the lowermost web, or apron, a trough is situated, which may be made of iron, and is to contain pitch and tar, or some similar compound, heated so as to keep it in a melted state. By means of a roller, the two contiguous portions of the wire web, that is, the upper portion of the lower, and the lower portion of the upper, are pressed down so as to dip into the melted compound. When these are made to revolve with the fleece between them, the latter is saturated with the compound; as it passes out of the trough the whole is pressed between metallic rollers, which condenses the felt and forces out all the superfluous matter. When delivered upon a table, it may be rolled up, or cut into sheets.

The foregoing is intended for the covering of ships, houses, &c.; but when saturated with size, or glue, mixed with clay, whiting, lime, or other suitable substance, it is to be used as a substitute for mill-board, pasteboard, floor cloth, and applied to other purposes.

The claim is to the method of subjecting such materials as are named, whilst between endless webs of wire, &c. to the action of the rollers, and of such liquids as may be desired.

---

42. For an improved mode of *Spinning Rope Yarn,* and yarn for cords and lines; James Church, jr. Hartford, Hartford county, Connecticut, May 22.

Nine lines contain the specification, which consists of references to a very indifferent drawing. The object appears to be to enable the spinner in a rope walk to turn the band wheel which drives the spindles. He is to attach himself to a long band, and walking backwards give motion to a whirl upon a shaft, and this, by bevil gear, is to turn the band wheel.

We had much rather invent such a machine than work with it, as we do not admire that labour saving machinery which is to force a man to work harder than ever; we think the present contrivance well calculated to save one man by wearing out another.

---

43. For an improvement in *Propelling Boats by Machinery,* by what is denominated the "Spiral Propeller;" Josiah Copley, Warrior-mark, Huntingdon county, Pennsylvania, May 22.

A shaft is to have affixed to it eight, or any other number of vanes, or fans, forming segments of spirals. These shafts are to be placed under water, parallel with the keel, and a rapid rotary motion given to them. It is proposed also to use them for driving machinery, by placing them in currents. The claim is to this kind of wheel, and its various applications.

We have had many opportunities of noticing this mode of pro-

pelling under various modifications, and have nothing new to offer upon a subject upon which all experience is at variance with the deductions of the present patentee. The specification before us is written wth considerable talent, it enters with much minuteness into the reasons upon which the conclusions of the patentee are founded, and, were the thing new, we should say that upon the face of the argument it merited a trial; it, however, has been tried with segments of nearly all possible sizes, and all possible angles, and that with uniform disappointment; that it will be again tried by the present patentee, with all the precautions which he has indicated, we have no doubt, as he is convinced in his own mind that he has discovered the causes of previous failures, and the modes of obviating them; still we are confirmed sceptics.

---

44. For a new mode of *Cogging or Bushing Sheeves for Ships' Blocks,* and for other purposes; Rhodes Kingsbury, Bath, Lincoln county, Maine, May 22.

The bushes, or cogs of sheeves, are usually made of iron, with a triangular plate, or flanch, on one side, which is to be let into the sheeve, and rivetted through at each of the corners. The mode now patented is to make the bush, or cog, cylindrical on the outside, to cast or cut a screw upon it, and to screw it into the sheeve, where it will remain firmly fixed, without the letting in of a plate, the insertion of rivets, or any other fastening than the screw. The patentee states that the whole strength of the sheeve is thus preserved, the danger of becoming loose obviated, and three-fourths of the labour of fixing, saved.

The claim is to the application of a screw in the manner, and for the purposes, above designated.

---

45. For an improvement in the machine for *Washing, Separating, and Saving Alluvial Gold;* T. W. A. Sumter, Poplar Grove, Iredell county, North Carolina, May 22.

This machinery consists of many parts, the principal of which are a *rocker* and a *trough.* The rocker is a box or spout, into which the earth is first thrown, where water is suffered to pass upon it, whilst a rocking motion is given to it; being a little inclined, the larger stones pass to its lower end, and are allowed to escape; it has a sieve in its bottom through which the sand, gold, &c. passes into the second vessel called a trough, which is a semi-cylinder, usually made of iron; it is supported upon spring poles, which serve to give it a vibratory motion.

The claims are to "the spring poles, and the manner of using them, and the *rocker* and its appendages applied for the purposes of washing and saving gold, in the manner above described."

How far this apparatus may be superior to what has been used elsewhere, we have not, at present, the means of determining. The drawings show the general structure of the machinery, but they are very indifferently executed, and leave much for the imagination.

A law was passed during the late session of congress to enable Vincent de Rivafinole to take out a patent for a machine for washing gold, which, in our judgment, will prove to be so far superior to every preceding instrument for the purpose of washing the alluvial deposites, as completely to supersede, or to leave those persons far in the rear who employ them. When the patent is completed, the particulars will be published in this Journal.

---

46. For an improvement in the *Portable Furnace for Cooking*, and other purposes; William A. Haggerty, Thomas C. Lawrence, and Thomas Frazier, City of New York, May 22.

The tripartite *invention*, under the above title, is very briefly described, the whole specification being comprised in the following lines.

"The improvement claimed by the subscribers consists in the manner of lining the insides of kettles, (of cast or sheet iron, or other suitable material) with bricks of clay. Within the lining, and secured midway between the top and bottom of the furnace, is a grate, constructed of any suitable material, having an aperture underneath it, for the admission of air. On the upper surface of the furnace are placed any suitable number of knobs, or projections, for elevating the utensils, and furnishing the draft. The brick lining may be secured together by bands or hoops of iron, or other suitable material, and may be constructed of any shape required."

Short as is the foregoing specification, we think that it might have been given in fewer words than the inventors count in their names. "Line a furnace with brick," would, we think, have exhibited the whole body and soul of this "*new* and useful improvement," and as "brevity is the soul of wit," we should have found this in the specification at least. The inquiry into the respective contributions of these *joint inventors*, is one which might possibly involve much difficulty; we apprehend, however, that it would be found to amount to *ten dollars* each.

There is not any drawing accompanying this specification, although the law is imperative on this point, "and shall accompany the whole with drawings, and written references, whenever the nature of the case *admits* of drawings," are the words employed. A furnace, with an ash pit, grate, knobs, brick lining, &c. certainly *admits* of being drawn. Were any further evidence required that the thing might be drawn, it is supplied by the fact that a *model* has been deposited in the patent office.

---

47. For an improvement in the art of *Stringing Piano Fortes*, denominated "Cross Stringing;" Alpheus Babcock, Philadelphia, Pennsylvania, May 22.

(See specification.)

---

48. For a machine for *Thrashing Rice*, and all other kinds of small grain; Ephraim Sands, Cincinnati, Ohio, May 24.

When we take up a patent for a washing, or thrashing machine, notwithstanding continued disappointment, we still hope that genius may have contrived some new mode of effecting these objects; when the period arrives for the justification of these hopes, our delight will be expressed in no measured terms; that time, however, has not yet come: we have again a cylinder set with teeth, a hollow segment, likewise set with teeth, the usual feeding apron, and other old acquaintances, linked arm in arm, pretty much in the old fashion. After poring over some half dozen pages, we arrive at the information that "the above is a true specification of my improvements." No one thing is particularized, the whole congregation of parts, braces, whirls, cylinders, bands, cog wheels, and teeth, making part of the said "above."

---

49. For an improvement in *Cloth and Hair Brushes;* Herrick Aiken, Dracut, Middlesex county, Massachusetts, May 24.

"The bristles, or hair, is twisted between wires, making a spiral brush, and trimmed to a suitable length. The spiral is then bent into any required shape, and the two ends of the wire are brought together, and put into a handle, and then secured." The foregoing will give a sufficient idea of the mode of making these brushes. The claim is to "the construction of the foregoing brushes, for clothes and hair. But I do not claim the principle of twisting hair or bristles between wires for making brushes, this having been before done."

---

50. For an improvement in the *Saw Set;* Herrick Aiken, Dracut, Middlesex county, Massachusetts, May 24.

This instrument is to set saws by punching. The saw is laid upon a bed of steel, so that its teeth pass under an angular faced punch attached to a lever, and raised by a spiral spring. The punch is struck by a hammer. The saw rests upon the bed, sloping towards the back, so as to raise the teeth, and allow of their being set; this inclination of the bed is regulated by a screw.

---

51. For an improvement in the *Machinery used for Spinning Cotton*, and other materials, consisting in the form of a *Flyer*, or *Traveller;* James Bogardus, City of New York, May 25.

This is another form of the ring groove spinner. There is a metal cap in the form of a truncated cone, surrounding each spindle, the opening being somewhat larger than the bobbin which is to run within it. The upper edge of the cone is surrounded by a rim somewhat like that produced on the upper edges of tin vessels, where the tin is turned over a wire; this rim is to retain the *Flyer* or *Traveller*, which consists of a piece of wire bent round so as to form a ring, excepting that the two ends do not touch each other. This ring is to be sprung over the rim, around which it will then play freely; this ring serves to retain the thread in spinning.

The patentee is very particular in giving directions for the exact form of the rim around which the traveller plays—states that travellers have been before used in various shapes, but never with complete success until the working parts received the form which he has given to them, and claims only "the form and application of the traveller as specified." The arrangement most nearly resembling the present, which we recollect to have seen, is that patented by Messrs. Addison and Stevens, of New York, in October last, and described at page 27 of our last volume.

---

52. For a "*Labour Saving Machine;* Ichabod Lewis, Irville, Muskingam county, Ohio, May 25.

We are told in the specification that this machine "may be used in the art and manufacture of chairs, bedsteads, wheels, &c.; or in the manufacture of any articles where turning, boring, and sawing are required; and consists of an improved turning lathe, (in the principal wheel,) a machine for boring, and one for sawing, both of which latter are adapted to the lathe. And in the application of animal power, (of the dog kind) for the purpose of propelling the same. Whereby much manual labour is saved, and the manufacture of chairs, &c. &c. greatly facilitated."

The improvement on the lathe, is a hollow wheel for a dog to walk in to give motion to the machinery. The arms of the wheel are in the middle of a wide rim, like the band wheel of the yarn spinning machine, but 12 feet in diameter, and wide enough for the animal; "which leaves it open on each side, and allows us the advantage of tying the dog in the most proper place;" this, we are told, is the "*principal improvement.*"

The boring machine is pretty much like other boring machinery, with bits fitted in the lathe. The sawing part is a head which may be fixed on the lathe bench, and the saw, which is narrow, and fixed in a small frame, worked up and down by a crank on a whirl, worked by a drum and strap. These things are very imperfectly described, but they are not claimed. The whole claim is in the following words. "The improvement in the construction of the principal wheel, I claim as my invention, let it be applied to what purpose soever; or propelled by animal power of any kind."

---

53. For a *Plough;* Samuel Nisbet, Toboyne, Perry county, Pennsylvania, May 25.

"The mould board and sheaths are made of cast iron, and cast together solid." We are then told how the tenons, stays, &c. are placed; that the *share* and *coulter* are of wrought iron, and of the common shape, and the same respecting the beam and handles; the claim is to "the construction of the mould board and sheath;" we do not understand what the construction is, the mode of connecting and supporting them being all that we find mentioned.

54. For a machine for *Sawing, Mortising, Tenoning, &c.;* Benjamin Overman, Greensborough, Guilford county, North Carolina, May 27.

This machine, and that of Mr. Lewis, No. 52, are both called "Mechanics' Assistants," a generic name for many patented machines intended to answer several different purposes.

We shall not pretend to describe this machine, as in its construction there is nothing peculiar, but merely the patentee's mode of arranging saws, chisels, wheels, &c. the whole of which appears to be claimed in the following terms. "Every improvement herein described, invented, made and used by me, Benjamin Overman."

---

55. For an improvement in the *Churn;* Iram Brewster, Blenheim, Schoharie county, New York, May 28.

A vertical churn has two sets of dashers, turning horizontally, one within the other, in reverse directions. The shaft or collar of the outer dashers is perforated at the top, and the shaft of the inner ones passes through this perforation, and into a step at the bottom of the churn. A vertical toothed wheel turned by a crank, gives motion to pinions, or trundles, on each of the shafts. There is no claim, the whole arrangement being considered as new. A patent for a "Double Revolving Churn" was obtained by Messrs. Barney and Beach, of the State of New York, on the 5th of February last, but in this the churn itself revolved in one direction, and the shaft, carrying dashers, in an opposite direction. See vol. v. p. 292.

---

56. For an improved *Machine for Lifting Ships out of the Water;* Thomas Evans, City of New York, May 28. Assigned to William Ballard, of the same place.

(See specification.)

---

57. For a *Portable Furnace,* called the "Taylor's Furnace;" Asher W. Roberts, Hartford, Hartford county, Connecticut, May 28.

This "Taylor's Furnace," is very much like that described in No. 46, or very much like a common chaffing dish. It is merely a quadrangular box, of sheet or cast iron, with a grating in the middle to support the fuel, an ash pit below, and two or three bars above upon which to place the goose. The part containing the fuel is to be lined with soap stone. "The above is a true specification." We beg pardon, there is to be a handle to carry it about.

---

58. For an improvement in *Glass-makers' Moulds;* Deming Jarves, Boston, Massachusetts, May 28.

The improvement claimed is the forming of a handle, or handles, or other similar projections, on glass cups, by pressure, at one ope-

ration, instead of attaching them to the cup after it has been blown, in the way heretofore practised.

The mould is to be made in the usual manner, of brass, or other suitable metal, excavations being provided for the formation of the handles. The plug, or piston, which is to form the inside of the cup, is made to fit exactly into a rim which forms the top of the mould, so that when it is pressed down none of the fluid glass which has been put into the mould can escape at top, but will, by the pressure, be forced into the cavities described.

The claim is to the forming the mould in the manner above indicated.

---

59. For a compound of medicinal substances, called *The Chemical Catholicon*, or Smith's Sanative Medicine; Isaac W. Smith, M. D. Lockport, Niagara county, New York, May 28.

Without publishing the recipe, we will state that the ingredients which enter into its composition are sulphate of magnesia, [Epsom salts,] water, sulphuric acid, and muriate of mercury [corrosive sublimate.]

This "sanative medicine" is to "cure a variety of diseases, among which are *dysentory*, cholera morbus, *billious cholic*, habitual costiveness, vertigo, or dizziness of the head, and hypochondria."

We are told that "where the above is to be administered to persons afflicted with scrofulous affections, the solution of muriate of mercury is to be omitted." Query, will the doctor accompany his patent medicine bottles, carrying each kind with him, and examine all who are about to swallow his *sanative* draft, to see whether they are scrofulous or not? We trow not.

---

60. For a *Washing Machine;* Enoch Walker, Woodbourne, Susquehanna county, Pennsylvania, May 29.

A fluted board is placed at the bottom of a water tight trough; a roller of a foot in diameter is placed above this, and between the roller and the board, pressure is made upon the clothes to be washed. The fluted board is to be raised at one end by means of a treadle, when the roller will pass over it by its gravity, and return when the board is lowered. A cistern to contain water, and a furnace to boil it, are placed at the end of the trough. Rollers, or wheels, are fixed under the machine to move it about from place to place. The roller which acts upon the clothes is to be made to run, occasionally, upon the lid of the trough, to serve as a mangle, and save ironing. This much is necessary to the understanding of the following claims.

"What I claim as my invention is the general construction of the machine as aforesaid, working the said fluted board or frame with rounds and roller by the same motion; the application of the treadle to washing machines; the wheels to move them about; the reservoir of heated water as aforesaid; the mangling with said roller, and pressure, instead of ironing the clothes, and the application of said

parts to every other purpose that will answer, not heretofore patented."

The drawing is without written references; the claim covers too much ground, as several of the parts mentioned have been before used, and if they had not, we should much doubt the validity of a patent for putting wheels, or castors, on to a machine for the purpose of moving it about.

---

61. For a *Cooking Stove;* Lewis Peterson and Peter Peterson, Pittsburgh, Allegheny county, Pennsylvania, May 29.

The stove described is to be made of cast or sheet iron. In the front is the door of the oven, and that for the fire-place. The oven extends from top to bottom, and from back to front, with the exception of the spaces left for the flue. The fire-place is on one side of the oven, and the flame and heated air from it are to pass round the other three sides; the flame first rises, and passes over the oven, and under the top plate, then down between the oven and one of the end plates; then under the oven and fire-place, and up at the other end of the stove to the pipe, or chimney. The top plate has three perforations to receive cooking vessels.

There is no claim made, but the advantages presented by this stove are particularly detailed. The patentees say that "it is simple in the construction, and not liable to get out of order; consumes very little fuel; will take up but very little room; can be placed in any part of a room to suit convenience; a saving of labour to the cook; and will do away the necessity of the principal cooking utensils used in a kitchen, inasmuch as this stove comprises every convenience necessary for cooking. Baking, roasting, boiling, steaming, stewing, frying, and broiling, all can be done at the same time, without any inconvenience one to the other."

---

62. For a *Washing Machine*, called the "Susquehanna Washing Machine;" Stephen Hinds, Montrose, Susquehanna county, Pennsylvania, May 29.

An oblong trough is made, as usual. The bottom of this trough rises in the middle, sloping off towards each end, like the ridge of a house, the angle, however, being very obtuse. Above this bottom is placed a frame, formed of slats, and extending the length of the box; which frame vibrates upon gudgeons, placed just above the ridge in the bottom. Two levers, one at each end of the box, and having their fulcra on one of its sides, are connected by ropes to the opposite ends of the vibrating frame. Above this frame there are two others, similarly formed, but not reaching to the middle of the trough; between these and the vibrating frame the clothes are to be placed, and operated upon by alternately pressing upon the levers, one hand being placed on each. Such is the "Susquehanna Washing Machine," which certainly has the merit of being differently arranged from most of its compeers; we, however, doubt its superiority, whatever it may possess of novelty.

63. For an improved method of *Applying Water to the Water Wheel,* known as the small flutter wheel; Edward Pritchard, Scriven county, Georgia, May 31.

The water is to be supplied to the common saw mill flutter wheel by two shoots instead of one; one of the shoots being placed above the other. "The water is made to act upon three floats at the same time; it also acts upon the outer extremities of the floats, or buckets, taking the advantage of the whole length of the lever; thereby doing away with the possibility of the *paradox* principle operating so as to retard the wheel, and using the whole head of the forebay."

"That of the above which I claim as my invention and improvement, is the applying of the two sheets of water to the water wheel, known as the *flutter wheel,* and used for saw mills."

---

64. For an improvement in the *Steam Engine;* Charles Potts, Philadelphia, Pennsylvania, May 31.

The object proposed by the patentee, is to produce greater safety in the steam engine, by insuring a constant and uniform supply of water to the boiler.

A float is to be placed on the end of a lever, within the boiler, in the manner of the ordinary ball cock, the fulcrum of this lever is to pass through a stuffing box, to the outside of the boiler; this it may do below the seat of the safety valve, or in any other convenient position. The short end of this lever, or that without the boiler, is intended to be connected with a valve in the supply pipe, which is to regulate the quantity of water which passes into the boiler. This valve is placed between the condensing tub and the hot water pump; when the valve is completely open, it is to allow water enough to pass for a full supply of the boiler, at the time of the greatest evaporation. The short end of the lever to which the float is attached, the patentee calls an index, as the angle at which it stands indicates the position of the float, and consequently the height, or depression, of the water in the boiler. A rod connects the index with the supply valve; when the float is at the lowest allowable point, the valve is entirely open, and as the float rises, the valve closes, and the supply is diminished.

The claim is to the arrangement by which the motion of the float is made "to regulate the supply of water to the *hot water pump,* exactly in the ratio of the evaporation from the boiler; and also to its operation as an index, and tell-tale."

A paper, by Mr. Potts, giving an account of the foregoing, was inserted in the July number; our notice was written before the latter was received, and we have not thought it necessary to suppress, or alter it.

Specifications of American Patents.

Specification of a patent for an improvement in the mode of laying the foundation of Marine Rail-ways under water. Granted to James Ronaldson *and* John Lindsay Neill, *of the City of Philadelphia, May* 22, 1830.

Our said invention is particularly intended for marine rail-ways in places where, from the nature of the bottom of a river, or other water, on which it is to be established, piles cannot be securely driven, or where the expense of driving them, and of erecting the required structure upon them, would form a serious objection thereto.

It is also applicable in all situations where the bottom is of a hard substance, and is equally efficacious with a foundation of piles, and can be carried into operation in many instances with much greater facility, and less expense.

A proper survey of the bottom upon which the rail-way is to be erected, must first be made, in order to ascertain the proper shape, or curvature, which should be given to the under part of the frame work, of which the foundation and rail-way, below the water, are to consist. This frame may be made and braced together in various ways, the sills being so formed as to adapt themselves to the bottom, and the upper part, or rails, having such an inclination as may be considered best for the intended purpose.

In forming the *Philadelphia Marine Rail-way*, the work was put together over the place where it was to be used, but it may be formed or framed elsewhere, and transferred to its place of destination. The framing was commenced by fixing a number of beams strong enough to sustain the intended superstructure, and in such relative positions as that a line crossing them would have the same curvature with the bottom of the river, which is to be the foundation. Upon these beams were laid three sets of sills parallel to each other, the centre sill being situated under the keel rail, and the two side ones under the bilge rails. The sills were united together by logs forming cross-ties; and into the upper sides of the sills were inserted posts to support the rails. These posts were tenoned into the sills sufficiently deep to admit of a trenail. The whole of the sills, rails, and posts, being strongly braced by timber framed into them diagonally and otherwise, to give them the required strength, iron bolts, dovels, and trenails, were also driven when they were deemed useful. The scarps of the rails, or wooden ways, were all doveled and bolted, and made to rest on the posts: the ways were likewise doveled to each cross-tie, besides bolting. The upper sides of the rails, or wooden ways, were made perfectly even, and the iron rails then securely bolted upon them.

The manner in which this framing was effected, is represented in the drawing, and also in a model deposited in the patent office; they are deposited in compliance with the law, which requires that drawings, with written references, be furnished; and they serve to ex-

hibit in a practical way, how the invention has been carried into effect.

The frame when completed is to be sunk into its place. Before this is done, the bottom upon which it is to stand, must, if covered by any loose substance, be scraped, so as to remove whatever might interfere with its adapting itself thereto. The mode which we adopted for sinking the frame, was, first to lay a floor upon the cross logs, or ties, and fasten plank to the sides. These planks were to keep in the stones, or material used to sink the frame. The supporting beams were then removed, and the whole frame let down by tackles that held it suspended when the cross bearings were taken out. To save the trouble and expense of procuring large stones, small ones were put into barrels and headed up, in order to retain them in the situations where they were required. The frame was thus sunk into its place, and loose stones, earth, and sand, thrown into, and around the whole.

We claim as our invention, the mode in which the above frame was put together; and we claim as new, and as our invention, this method of making the foundations, and the fixing of marine rail-ways under water, without the driving of piles, the making of coffer dams, the using of diving bells, or any similar structures, as usually employed for that purpose.

If the rail-way is intended for large vessels, the having *five* rail-ways, viz. one under the keel, one under each bilge, and one on each side for the support of the upper works of the vessel with shores, are all considered modifications of the principle herein described, and we accordingly claim this method also as our invention.

JAMES RONALDSON.
JOHN L. NEILL.

Specification of a patent for an improvement in the art of Stringing Piano Fortes, denominated by the patentee "Cross Stringing." Granted to ALPHEUS BABCOCK, *Philadelphia, Pennsylvania, May 24th,* 1830.

MY invention and improvement consist in having the two strings of each note formed of the same unbroken wire, which is secured at each end on the turning-pin-block, in the ordinary way, passes over the sounding board bridge, on which the two strings which it forms are kept asunder by a small pin, and is then twisted once or more; or the two strings are made to cross each other, so as in either case to form a loop, or eye. This loop, or eye, is then made to double round, or hook upon a pin on the pin-block, or on the metallic plate, which in some pianos advances from the pin-block, towards the sounding board bridge; or otherwise the loop, or eye, is passed over and fixed on a hook made in the end of a rod, or stout heavy wire of metal, which is fastened at the other end into the pin-block, or into the metallic plate, (above spoken of,) and projects to within a

short distance of the sounding board bridge; so that the strings have the same line of direction from the pin-block to the turning pins.

(*Note.* By inserting two pins instead of one on the bridge, the strings may be arranged without crossing, or twisting them; but, in such case, the strings must change their line of direction at the bridge, and a lateral strain is of course produced, unfavourable to the durability of the instrument.)

The mode of stringing described in this specification is applicable to all instruments of two or four strings, whether made with metallic or wooden frames. The modification of it which I prefer, is that which includes the use of the metallic rod between the strings and the pin-block.

The advantages gained by this arrangement are the following.

1st. The strings are less liable to get out of tune; inasmuch as the part of them beyond the bridge is by this mode of stringing greatly shortened. For the same reason the strings are more easily tuned; the friction of the string on the bridge, in the process of tuning an ordinary piano operating always to prevent an equal degree of tension on the two sides of the bridge, and in fact often causing the bridge of the sounding board to support much of the strain which should properly be borne by the pin-block only.

2nd. The sounding board bridge is relieved from the lateral strain which in the common piano is occasioned by the strings changing their line of direction, after crossing it; as well as from the strain alluded to in the foregoing paragraph; thus increasing the durability of the instrument.

3d. The false tones, to which all ordinary pianos are more or less subject, produced by the vibration of the strings between the bridge of the sounding board, and the pin-block, are obviously prevented by this improvement, and the tone of the vibrating part of the string is left clear and brilliant. ALPHEUS BABCOCK.

Specification of a patent for a machine for Lifting Ships or Vessels out of the Water. Granted to WILLIAM BALLARD, *of New York, as assignee of the inventor,* THOMAS EVANS, *of the City of New York, May* 28, 1830.

THE invention above mentioned consists in the application or substitution of cylinders with floating pistons in them in place of screws, or other machinery, in the vertical lift docks now in use. These cylinders with their pistons are constructed in precisely the same manner as what is known and called Bramah's hydrostatic, or water press, and are applied to the lifting of ships in the following manner, to wit; such a number of piles are driven in the river, as to form two piers at such distance apart as to allow a ship to be floated in between them; those piles which form the inner row of those piers, are driven at regular distances asunder, and are firmly secured together by large pieces of timber called plate pieces, running the

whole length of the dock, on each side, level, or even with the surface, or decks of the piers. Between these piles, and from said plates, are suspended a row of cast iron cylinders at equal distances apart, and directly opposite each other, on either side of the dock. Each of these cylinders is furnished with a solid iron piston, sliding through a stuffing box in the head of the cylinder; each piston has a cross head, fitted on its upper end, reaching to square posts framed into the plate, half way between the cylinders. These posts form guides for the cross heads, causing them and the piston to which they are connected, to move perpendicularly to the cylinders. From the cross heads iron bars are suspended on either side of each piston, reaching down through the plates to the trussed beams, or girders, which form the cradle for supporting the ship. These bars pass through the ends of the beams aforesaid, and are strongly secured to them by iron keys passed through the bars on the under side of the beams. These beams are made of great strength by a peculiar method of trussing them; they reach the whole width of the dock, two to each pair of cylinders forming a section; a number of sections forming the cradle; the length, breadth and strength of which will depend on the size of the ship to be lifted. Each section moves independent of the rest, and can be raised or lowered at pleasure. The cylinders are connected together on each side of the dock by a pipe running the whole length thereof. In these pipes, between each cylinder, there is a stop cock, shutting off the communication between them when necessary. One or more pumps are attached to these pipes for the purpose of forcing water into the cylinders for raising the ship. Other stop cocks are provided for letting the water out of the cylinders when the ship is to be lowered.

Operation.—The water being let out of the cylinders by turning the cocks aforesaid, the pistons by their weight settle down in the cylinders, carrying the cradle along with them; and when the pistons are wholly within, the cradle is sunk low enough beneath the surface of the water to allow the ship to be floated in between the piers, and over the cradle; she being moored in the centre between said piers, her keel is directly over the keel blocks. The pumps being now set at work, the cradle is raised till the sections have all found their bearings. The bilge wedges are now hove up to steady the ship in her position. She is now lifted some distance further, when being safely shored, she is by the continued action of the pumps safely and expeditiously lifted out of the water.

The lowering of the ship is a work of great simplicity; a number of escape cocks on each side of the dock are opened and she descends by her own weight with a steady, constant motion, till she finds her bearing in the water.

Now I wish to be understood that what I claim as new and my invention, is the application of what is called the hydrostatic principle of forcing water into cylinders, after the manner of what is known as Bramah's press; the raising of the pistons by the injection of water into the cylinders in which they are inserted, being applied to lifting the ship in the manner described above. And further, be it

known that I do not confine myself to the particular manner of application as described above; that only appearing the most convenient at present. T. Evans.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Remarks upon Mr. Charles P. Sakmeister's *patent for improvements on the Piano Forte.*

To the Editor.

Sir,—As you appear to desire to elicit truth in your examination of patented inventions I am induced to offer a few remarks upon one issued on the 14th of May last, to Mr. C. P. Sakmeister, of New York, for improvements in piano fortes. Having had an opportunity of examining the specification and drawings, explaining the so called improvements, and claiming some knowledge upon the points to which they relate, you, perhaps, may not deem my remarks impertinent.

Mr. S. claims, in his specification, three improvements, the first the introduction of a lever check to prevent the reverberation of the hammer. Secondly, a lever upon which the front catch is placed, and the manner in which it is made to act upon the hammer. Thirdly, the shape of the hammer, of the inverted action, (as practised by the Germans.)

With respect to the first, I witnessed the same thing in the manufactory of Messrs. Loud & Brothers, of this city, three or four years since; the action then made by them was so similar to that described by Mr. S. that had it been made since his patent was obtained, any one upon examination would at once declare that his plans had been copied from it; they are, in fact, alike in the lever and its attachments, and in the mode of its operation in every important particular, (I speak of its application to the English action.) The front catch is merely an inversion of the other, its principle being the same.

I am convinced, however, that in practice, whatever advantages it might have offered were more than counterbalanced by its defects, as the Messrs. Loud do not continue to use it. Its complexity probably subjected it to frequent derangement. The simple check attached to the key, is, upon the whole, certainly preferable, as by the very easy contrivance of taking off the top part of the action, the key can be taken out.

With respect to the shape of the hammer, one exactly similar to it was formerly used by Mr. Albrecht, of this city, and it is believed that it had been previously employed by other makers.

These remarks, sir, are not invidiously made; the writer would hail with pleasure any real improvement in his business, by whomsoever introduced. The gentleman who has taken the patent, may, like many others, have stumbled upon something which he may have

supposed to be new, but which appears fairly to belong to your class of *modern antiques.* A Manufacturer.

Philadelphia, August 10th, 1830.

Notice respecting the Mortising Machines patented by Mr. John M'Clintic, *of Chambersburg, Pennsylvania, in* 1827, *and by* Mr. Abner Foster, *of Phillipston, Massachusetts, in* 1830. *Extracted from a letter to the Editor from the former gentleman.*

Sir,—In examining the number of your very valuable Journal for the present month, I find that mention is made of an improvement in the mode of mortising, in various kinds of joiner's work, for which a patent was obtained by Mr. Abner Foster, in April last. You remark that the machine is very clearly described, and very perfectly represented in the drawing, and that in its general structure it resembles the machine patented by me in October, 1827. You very correctly state that in mine the chisels are brought down and raised by means of a lever moved by hand. In Mr. Foster's *improvement* it appears that the levers used are called *treadles*, as they are operated upon by the foot, and that the chisels are elevated by spring poles. The only parts claimed, are, you say, "the springs and the treadles, and their application to the purpose of mortising."

Upon examining my specification, it will be seen that even in these particulars Mr. Foster has been anticipated by me. The following words will be found in it: "the gate, or part which holds the chisels, may be worked by *treadle* and *spring*, to raise the gate."

Independently, therefore, of the general structure of the machine being similar to mine, it will be at once evident that in the points specifically claimed by Mr. Foster, the ground had been clearly and distinctly pre-occupied by me.

To one who has manifested so much zeal for the diffusion of correct information on the useful arts, I need make no apology for the trouble I now give.

Yours, &c.

John M'Clintic.

Chambersburg, Pennsylvania, July 31, 1830.

ENGLISH PATENTS.

To William Godfrey Kneller, *Chemist, for certain improvements in Evaporating Sugar, which improvements are also applicable to other purposes.* Dated May 27, 1829.

I, the said William Godfrey Kneller, do hereby declare that my invention consists in a method or process, and certain apparatus as hereinafter described, by which I am enabled to evaporate liquids and solutions at a low temperature, and thereby to avoid the injury to which certain substances which require a nice and delicate appli-

cation of heat, such as sugar, for instance, are liable to, by being exposed to too high a temperature. And I do further declare that my said invention and improvements consist in forcing, by means of bellows, or any other blowing apparatus, atmospheric or any other air, either in a hot or cold state, through the liquid or solution subjected to evaporation; and this I do by means of pipes, whose extremities reach nearly (or within such distance as may be found most suitable under peculiar circumstances,) to the upper or interior area of the bottom of the pan or boiler containing such liquid or solution, the other extremities of such pipes being connected with larger pipes which communicate with the bellows or other blowing apparatus, which forces the air into them. The pan or boiler may be of any shape or dimensions, but I prefer it with a flat level bottom, and I introduce the liquid or solution to the depth of from about four to six inches. The heat may be applied to the lower or exterior area of the bottom of such pan or boiler by naked fire, steam, or hot air, in the usual manner, and by means well understood; the air then forced into the heated liquid or solution keeps it in a constant agitation, abstracts its heat, and carries off the steam or vapour which is to be expelled. By raising the degree of heat under the pan or boiler, and increasing the quantity and velocity of the air injected into the liquid or solution, or on the contrary, by lowering the heat and moderating the injection of air, the evaporation is accelerated or retarded at the pleasure of the operator, according to the nature of the substances or the effect desired.

And I do further declare that in applying this my said invention and improvements to the evaporation of cane juice or sirop for making refined sugar, I can bring it to the proof or crystallizing point by keeping the temperature of such sirop, or cane juice, between one hundred and forty, and one hundred and seventy degrees of Fahrenheit's thermometer, although I prefer to keep it between one hundred and sixty, and one hundred and seventy degrees. By this simple and cheap apparatus I obtain a great quantity of large and shining crystals, which hitherto were attainable only by evaporating *in vacuo*, a very troublesome and expensive process, while other methods, by exposing the sugar to a high temperature, impair the quantity, size, and brilliancy of the crystals, and form a great quantity of molasses or treacle.

And I further declare that these my invention and improvements can be applied to the evaporation of other liquids and solutions, as well as sirops and cane juice, or sugar, by varying the apparatus and the degree of temperature according to their nature and the will of the operator.

And I further declare that these my invention and improvements can also be applied to distilling or rectifying spirits, provided that a vent be given to the air arising with the spirit after the latter shall be condensed.

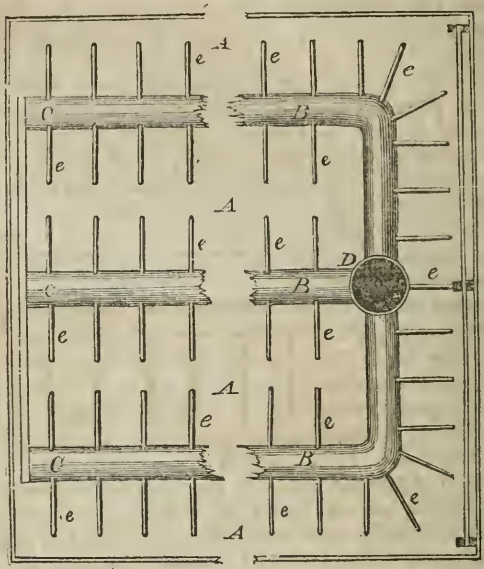
And I further declare, that in order more quickly to remove the steam or vapour from the surface of the liquid or solution, and thereby to favour the evaporation, I sometimes, and particularly when I

use hot air for heating the pan or boiler, conduct the hot air, after it has given out part of the heat to the bottom of the boiler, to the surface of the liquor or solution, but I do not consider this contrivance necessary in any, nor adviseable in all cases. It is hardly necessary to observe, that the evaporating power is augmented by increasing the diameter of the pipes, and the quantity of air propelled by the blowing apparatus through the liquid.

And I do further declare, that as it is desirable that the liquid to be evaporated should be of equal depth in every part of the evaporator, the bottom of which is recommended to be perfectly level; it will be found that the liquid when sufficiently évaporated and concentrated, does not readily flow out through the spout opened for the purpose; to remedy this inconvenience, I place a vertical sliding plate from four and a half to five inches in height, and somewhat less in length than the breadth of the evaporator or pan, such plate being kept in its upright position by projections at right angles with its lower edge, which must slide as nearly as possible in contact with the bottom of the same pan. This plate is in the first instance put at that end of the pan, or evaporator, which is opposite to where the spout is situated. When the evaporation is effected to a sufficient degree, I damp the fire, or shut off the steam or hot air, and open the spout to draw off the liquid, a great part of which will immediately flow out; I then by means of a winch, or lever, raise the pipes about six inches, and gently draw the said vertical plate by a thin wire or chain towards the spout, and thus quickly clean the bottom of the pan. It is necessary to raise the pipes in order that the before mentioned plate may pass under them, and at the same time not interrupt the blast of air through the small pipes, which might be obstructed if any of the evaporated liquid should congeal or crystallize in them by cooling. For effecting these objects the main pipe arising from the bellows or blowing apparatus, is inserted into the main pipe in the evaporator, in an air tight manner, but with a joint or flexible tube sufficiently long to allow the system of blowing pipes to slide upwards for about six inches. The form and construction of the apparatus which I use to produce the above effect, may be varied according to circumstances, and the form and position of the pan or evaporating vessel to which it is to be applied. But two things are essential in its construction, the first of which is, that however numerous the blowing pipes may be, that their lower orifices should be distributed as evenly and equally over the whole surface of the bottom of the pan as possible, and secondly, that a stream of air should issue from the lower end of every one of them at the same time. To insure this latter object it is immaterial whether the bottom of the pan or boiler be perfectly level, but it is quite necessary that all the lower ends of the blowing tubes should be on a level and parallel to the surface of the fluid to be evaporated, in order that there may not be a higher column of fluid in one tube than in another. The mode of construction necessary to produce these objects may be various, but in order the more distinctly to explain my meaning and my mode of operating, I hereunto subjoin a drawing of the apparatus

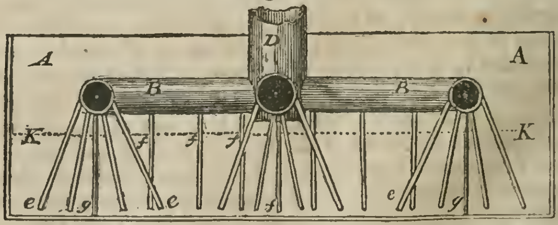
which I have used, and find to answer the purpose, and in which A, A, A, A, Fig. 1,* is a plan or bird's eye view of an oblong pan or boiler, B, B, B the tinned copper, or other large air pipes, which are closed at their end, C, C, C, but open into each other, and likewise into the still larger perpendicular pipe D, from which the air is

Fig. 1.



supplied by communicating as aforesaid, to bellows or other blowing machinery; *e*, *e*, *e*, *e*, &c. are the small lateral pipes which communicate with the large air pipes, and proceed downwards through the fluid to be evaporated, to very near the bottom of the pan. The lower ends, *e*, *e*, &c. of these pipes are all very nearly equi-distant from each other, to produce the equal distribution of air before mentioned. Fig. 2, is a transverse section of the pan, A, A, A, A, Fig. 1,

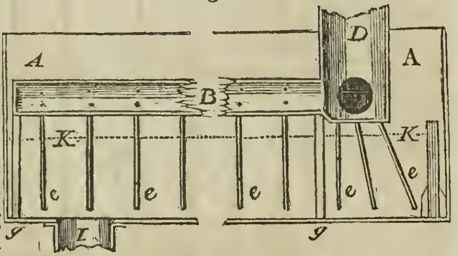
Fig. 2.



* In the original drawing the boiler is represented as extending to about three times the length seen in Figs. 1 and 3, the middle being omitted, as it is merely a repetition of parts similar to those shown.

showing the great air pipe D, the cross pipe and its continuations B, B, B, in section, and the small descending pipes *e*, *e*, *e*, *e*, &c. as shown in the last figure, likewise the pipes *f*, *f*, *f*, *f*, which likewise descend from the pipes B, B, but in a more nearly vertical direction, which prevents their being seen in the view, Fig. 1, but by means of which, the distances of the lower ends of these blowing tubes are brought to the same distance as under the pipes B, B, as in other parts of the pan. *g*, *g*, *g*, are legs to support the above described system of pipes, by standing on the bottom of the pan, and are of such length as will just prevent the lower ends of the said blowing pipes from touching it. The whole of this system of pipes is to be raised at once, as before mentioned, by any adequate machinery, in order to permit the scraping or cleaning plate, *h*, *h*, to pass under the ends of the before mentioned small blowing pipes. Fig. 3 is a longitudinal section of Fig. 1, of which a particular description will be unnecessary, as the same letters of reference denote the same parts in this and the other figures, the insertions of the small blowing pipes into the pipes B, B, being shown by black dots. In all these, Fig. 1 shows the situation near which the discharging valve or orifice should be placed, and K, K, is the line near which the surface of the fluid should stand when first introduced to be evaporated. As before mentioned, the form of this apparatus may be varied, provided its essential properties of the air blowing through all the descending tubes, and this being so disposed as to produce greatly divided and equally distributed currents of air over the whole bottom of the vessel at once, are maintained, because my invention consists in producing rapid evaporation at lower temperatures than usual, by the means hereinbefore described.

Fig. 3.



OBS.—It is well known that a current of air promotes evaporation, and is in many instances employed for that purpose by being made to pass over the surface of liquids; the principle on which the foregoing patent is founded, consists in forcing air *through* liquids, and we are inclined to think it will prove more efficient, inasmuch as the air is not only brought into intimate contact with many, and constantly changing surfaces of the liquid, but also strongly and incessantly agitates it; the effect of such agitation is an increase of evaporation and decrease of temperature, which points are to be considered as advantages of importance in all cases where liquids are to be converted into vapour at a lower degree of heat than their boiling point, under the common pressure of the atmosphere.

It has been stated to us, that by Mr. Kneller's process the evaporation of water is more rapid at 180° of Fahrenheit, than by boiling

at 212°, and is consequently attended with a considerable saving of fuel.

The same object has been attained *in vacuo*, but the present apparatus, we readily admit, appears to have the advantage over that method, both in simplicity and cheapness, from its requiring fewer and less expensive vessels; in other respects the results must be similar, as the high temperature is avoided which injures the products by acting on the substances exposed to it, and favouring new combinations.

The refined sugar made by evaporating on this plan, has been represented to us as being equal, and in some respects superior to that evaporated *in vacuo*, as having the property of not being effected by a damp atmosphere; the former circumstance is so far in accordance with the theory, that a high temperature prevents the formation of large and shining crystals, and converts sugar into treacle or molasses; the permanency of the sugar in the open air may be accounted for by the crystallization taking place under an abundant supply of air, and not in the seclusion from the atmosphere.

The patentee in a communication he has made to us, observes, that "the same invention if applied to distilling ardent spirits, raises them in a *clean* state, and the injection of air accelerates their passage through the condensing worm; the low temperature prevents in a great degree the production of empyreuma; the air forced down upon the bottom of the still keeps it cool, and the agitation supersedes the necessity of *rousing;* and as the wash is not suffered to be heated to the boiling point, it can never rise into the *head* and cause the spirit to *run foul.* The sugar house of Messrs. Widder & Co. Gravel Lane, Houndsditch, is fitted up and worked with this apparatus." [*Rep. Pat. Inven.*

To JOSIAS LAMBERT, *Esq. for an improvement in the process of making Iron applicable at the smelting of the Ore, and at various subsequent stages of the process up to the completion of the rods or bars, and a new process for the improving of the quality of inferior Iron.* Dated February 4, 1830.

THE improvement in the process of making iron applicable at the smelting of the ore, and at various subsequent stages of the process up to the completion of the rods or bars, consists, in the application of salt, potash, and lime, mixed or combined together to the iron ore, or iron in the blast furnace, the refinery furnace, the puddling furnace, the balling or reheating furnace, or in any other process to which the iron in its manufacture is subjected when considerable heat is applied; and it likewise consists, in the application of salt, saltpetre, and lime, mixed or combined together to the iron in the puddling furnace, whether the same iron shall have been subjected to the application of salt, potash, and lime, in any of the previous operations of the manufacture or not.

The proportions in which I recommend the mixture or combination of salt, potash, and lime, to be formed, are two parts of salt, one part of potash, and two parts of lime; but should the proportions in some degree differ from those best adapted to the purpose, the useless portions will be dissipated in the process of the manufacture. The mixture or combination employed during the process in the blast furnace should be applied at the time of smelting the materials, which are to produce the iron, at the rate of about twenty-five pounds to the ton of iron, and may be introduced in proportionate quantities at the tunnel head of the blast furnace, either at intervals, or with every charge of the materials which are to produce the iron. If not used in the process of smelting, it may be applied at intervals to the metal during the operation in every charge of the refinery furnace, or in the puddling furnace, or in any other process to which the iron in its manufacture may be subjected when considerable heat is applied. A proper proportion to be used in the refinery furnace may be at the rate of twenty pounds to the ton of iron, and in the puddling furnace about eighteen pounds to the ton of iron; but in the balling or reheating furnace, and other processes, the quantity to be applied must depend upon the quality, form, and substance of the iron, taking care that it be sprinkled over and amongst, or brought in contact with the iron; the quantity to be employed will vary from about eighteen to thirty pounds per ton of iron.

The proportions in which I recommend the salt, saltpetre, and lime, to be mixed or combined, are two parts of salt, one and a half parts of saltpetre, and two parts of lime; should these proportions differ in some degree from those best adapted to the purpose, the useless portions will be dissipated during the process of the manufacture.

This mixture or combination of salt, saltpetre, and lime, should be applied to the iron in the puddling furnace whilst the metal or pig iron is in a state of fusion, and may be mixed with it at intervals at the rate of about twenty pounds to the ton of iron.

The quantities to be applied of either of the above mixtures will differ in some degree according to the quality of the materials or the iron; but the proportions above mentioned are those proper on the average.

The process for the improving of the quality of inferior iron, consists in the application of either of the same mixtures in similar proportions to such iron when subjected to considerable heat: for this purpose they may be applied to the iron, and the iron melted in combination with them, or they may be applied to the iron in the puddling furnace in such quantities as may be best adapted to improving the quality of the iron according to its properties more or less exhibited, of being what is termed red-short, or cold-short, (that is to say,) the application of the mixture of salt, potash, and lime, is best adapted to the iron which is termed red-short, and the mixture of salt, saltpetre, and lime, is best adapted to the iron termed cold-short; the quantity of the mixtures to be employed in either case, will vary from about eighteen to thirty pounds per ton of iron, according to the degree of inferiority of the iron; or the mixtures may be applied to the

iron in any reheating or other furnace, and the metal subjected to a red heat for a time proportioned to the quality, form, and substance of the iron, care being taken that the mixtures be applied in contact with the heated metal; and for this purpose, if the iron be in the form of tubes, such as gun barrels, the mixtures may be introduced into the tubes.

Observations by the Patentee.—The effect of this application in the blast furnace, is, to create a more perfect fusion of the earthy materials, and their separation from the iron in a more powerful degree than can be effected by any of the ordinary methods of burthening a furnace; the pig produced under this operation is considerably more pure than any obtained in the common smelting process. A similar effect is produced in the refinery furnace, the iron runs hotter, the cinders contain less of the metal, and their proportions of earthy materials are increased, whilst a saving in yield accrues to an important amount. In the puddling furnace the application of the mixture of salt, saltpetre, and lime, is of the most powerful efficacy in causing the decomposition of the carbon and the acid combinations that have resisted the operation of the refinery. Nearly all the bar iron produced from coke made pigs contains more or less of earthy bases; certain proportions of these influence the quality materially by contributing to the red and cold-short properties; the earths are brought into a fusible state and completely vitrified by the alkali and the lime, and being separated from the iron leave it pure and free from defect. It remains only to be added, that the practice coincides with the theory of this process, and the fact has been proved by an infinity of experiments upon the worst description of iron, which has corresponded with the anticipated effect, both in its mechanical and chemical properties. [*Ib.*

To JOSEPH MARIE URSULE LA RIGAUDELLE DU BUISSON, *Merchant, for a new method of extracting, for the purpose of Dying the Colour from Dye Woods and other substances used by Dyers.* Dated February 12, 1830.

THIS process is performed by means of steam caused to pass through the substance to be operated upon, which condenses in its passage and extracts the colour; it is then evaporated to any consistency at the pleasure of the operator.

The apparatus employed by the patentee is composed of a steam box lined with lead, and covered by a shallow metal pan; a pipe proceeding from a boiler, communicates at one end of the box, and filling it with steam, heats the pan and its contents in the course of the process; from the opposite end of the box a second pipe proceeds upwards through the bottom of a wooden chamber, (that is lined with glass or glazed earthenware) to the distance of about one foot from the top, the lid of this chamber is constructed so as to open, and when closed, to remain steam tight; a quantity of chips or saw dust of the

dye wood being put in at the top, it falls on a false bottom of perforated tin, and the steam being admitted into the steam box, will find its way through the pipe and fill the space that is left in the chamber; in passing downwards through the dye wood it condenses, and dripping on the real bottom of the chamber, which is placed on an inclined plane, is conveyed from thence by a small pipe to the shallow pan described; in this situation it is observed, the liquid thus produced may be evaporated by means of the steam that is below it,—even to powder if it be necessary. When the liquid flowing from the chamber becomes colourless, the whole of the dying properties of the wood has been extracted; the chips, which will be found bleached, may then be removed and a fresh portion operated upon.

In a clause at the conclusion of the specification, the patentee observes that, if the substance employed be of a resinous nature, the vapour of spirits of wine must be used instead of the steam of water. [*Ib.*

To George Pocock, *Gentleman, for improvements in making and constructing Globes for astronomical, geographical, or other purposes.* Dated February 4, 1830.

Mr. Pocock commences his specification, by detailing the disadvantages arising from the importability of globes of the usual construction, and in continuation states, that to obviate such inconveniences is a principal point of his invention. He, therefore, proposes to form them of paper, well pasted together at the edges, and with an aperture at the south pole, by which they can be inflated at pleasure: another method he adopts, is to construct a globular frame of thin cane, in the same way as applied to umbrellas; in both instances, however, he directs a wire or other support to be inserted through the orifice at the south pole, which, by means of a button at its upper end is attached in a corresponding eyelet hole in the interior of the globe at the north pole; to the latter part on the outside, are affixed three pieces of tape, of about a foot in length, with an ivory knob, to serve as a handle, attached to their centres; these tapes strengthen the globe, and a cane hoop for a similar purpose is attached to the orifice before mentioned, by means of a strip of linen pasted firmly over it and the edges of the globe.

A great portion of the specification is taken up by the description of a sort of air pump for inflating the globe; which operation, the patentee, however, states, may be performed by holding the cane hoop at the orifice firmly in the hand, and drawing it suddenly through the air; it is then to be placed on the carpet or floor of a room, and being raised about a foot from the ground and lowered alternately, it will be thoroughly distended.

He next describes a flexible scale for working problems, which he forms of tape half the circumference of the globe in length; it is divided into two equal parts, and ninety degrees north and south from the equator are marked on the left hand side; this serves for the

brazen meridian of ordinary globes. On the right hand side are marked one hundred and eighty degrees continuously, and under each, the corresponding number of miles; this is intended as a substitute for the quadrant of altitude, and much despatch, it is stated, will be gained by it in working problems. On the opposite side of the tape is an analemma done in the same way as the scale.

A modification of these globes is also described, formed with a vane at its upper extremity; a lamp being placed in the interior, will, on the globes being suspended by the rarifying of the air, cause it to revolve, and present an amusing and instructive object for young persons. The paper recommended by the patentee for the construction of these globes is that made of new Irish linen; its strength being an important object. [*Ib.*

To JOHN GRAY, *Gentleman, for a new and improved method of preparing and putting on Copper Sheathing for Shipping.* Dated February 4, 1830.

THE object the present patentee has had in view, is the preventing any projection or indentation in the sheathing of ships when fixed on them; and he causes a perfectly regular and smooth surface to be obtained, by forcibly forming indentations in the sheets, which will present corresponding projections on the opposite side, the heads of the nails being countersunk in the former, whilst the latter are admitted into the wood; this, it is stated, will also give additional security to the means of fastening the sheets.

The tool employed for forming these countersunk perforations, consists of a screw working in a socket formed in the centre of a metal frame or bridge, that is firmly screwed to a bench or table. The lower extremity of the screw is a conical punch, which, when screwed down, fits into a corresponding piece of metal having a small perforation formed through it, for the passage of the particles of copper that are punched out of the sheet. This latter after having been laminated and dressed, is placed below the punch, and the screw being turned by a lever passing through its top, the conical form of the punch will create a countersunk projection in the sheet of copper, into which the heads of the nails are to be made to fit, so as to present an even surface. The legs of the bridge above mentioned, are directed to be made far enough apart to admit of the passage of the sheets below it, and they thus serve as a guide for making the perforations in a right line. In affixing the sheets to the bottoms of vessels, they are to be caused to extend half way over each other alternately, in the usual manner.

A modification of this instrument is described in the specification, which the workman can employ in his hands without the necessity of its being attached to a bench; in this case, the screw socket and the indented metal for the reception of the punch are formed in one piece, from which also projects a handle: two small plugs that are raised and lowered by placing the thumb on a spring near the handle,

and are fixed at proper distances from the screw, serve as guides, by falling into the perforation made in a sheet, and thus retaining it in its proper position when drawn along to repeat the stroke of the punch. [*Ib.*

FRENCH PATENTS.

Patent for fifteen years, for methods of manufacturing Wire for Piano Fortes and other musical instruments. Granted to IGNACE PLEYEL, *of Paris.*

THE white wires are made from soft and very ductile iron wire. The French iron wires best suited for this purpose, are the kinds known under the name of *fer de roche.* We employ in this manufacture, only iron which has already been reduced into wire, at least to the dimension of two-thirds of a line in diameter. These wires owe their quality to the manner of tempering or annealing the iron wire, and of passing it through the draw-plates.

To anneal the wire, a fire place is built of bricks and mortar, of a cylindrical form, having its exterior and interior edges furnished with an iron hoop, beneath a large chimney. The dimensions of this fire place or furnace are proportioned to the quantity of iron wire intended to be annealed at one time, which is placed in it, upon an iron grate. This grate is placed so high, as not to allow the fire to touch the wire. The furnace is covered with a sheet iron cover, in which there is a hole, for allowing the smoke to escape. The iron wire is placed in coils upon the grate, till it reaches to about four inches of the top, the cover is put on, and a fire lighted with white wood only. The heat is kept up till the wire has acquired a pale red colour, and not more. That the fire may be distributed equally throughout, the cover should be frequently turned, because the hole in it would attract the heat, and, without that precaution, one side would be heated more than another. This method of annealing suits only iron wire of the size of one-third of a line in diameter: to draw it finer, the following process should be employed.

In the furnace already mentioned, at a certain height above the grate, are supports, on which another similar grate is placed. A strong plate of sheet iron is laid on each of these grates; the dimensions of the plates, allowing an inch all round for the passage of the ascending smoke, to allow the cinders to fall from the top, and to promote an equal communication of heat. The iron wire ought to be wound into a narrower space than the width of the plates of sheet iron, and placed on the lower plate in such quantity, as to reach the upper one. The lower fire place is filled with fuel, and the same combustible is placed on the upper plate, both fires are then lighted, the cover is put on, and frequently turned during the process.

In a furnace capable of holding fifty pounds of iron wire, the fire is kept up for four or five hours, the length of time depending, however, on the situation of the furnace and consumption of fuel.

The first process of annealing is commonly done twice on the same iron wire: the second is done after that wire has been drawn three or four times through the draw-plate, for reducing its diameter. The second process is employed but once.

Tools used in this manufacture.

These tools consist of, 1st, a wooden work bench four or five feet long, and three wide. 2nd, a plank, three feet long, one foot wide, and three inches thick, which is fixed to one of the edges of the bench by two pins. Above this plank two little barrels of wood are raised, ten inches in length and six in diameter, each having its axis placed in the direction of the width of the plank, and received in two brass supports, fixed firmly against the lateral sides of the said plank. The axis of each roller is furnished with a handle, for moving it. At the middle of the plank there is raised, to the height of the centre of the axis of the barrels, a piece of wood of the whole width of the plank, in which is a groove, four or five lines deep. At each extremity of this piece of wood two wooden uprights are framed, supporting a cross piece, in which is a second groove, corresponding to the first. A draw plate is adjusted, so as to slide easily between these two grooves. At each end of the same plank, and by the side of the draw-plate, a small piece of hard wood is placed, on which the ends of the iron wire are filed before passing them through the plates.

A sort of reel, nearly like those used for thread, excepting that it is conical, serves to receive the rings of iron wire intended to be drawn. The bench, serving as a foot for this reel, is raised to the height of the barrels.

On a small wooden upright, placed in a mortise made in the plank, between the barrel and the draw-plate, a little box is fixed, containing grease, composed of lard and tallow. There is a hole through this box, to allow the iron wire to pass through it, and become smeared with the grease.

To beat up the draw-plate when the holes are too much worn, and to pierce it, we employ a block of wood, similar to those commonly intended for receiving small anvils, and on which a mortise is made sufficiently deep.

A small file is used to reduce the end of the wire, when beginning to draw it; a pair of flat pincers for drawing it, when introduced into the holes of the draw-plate; a common hammer, and an iron gauge for measuring the sizes of wire; lastly, a draw-plate is the most essential tool that we must have for this work. The material of which this tool is composed, and the way in which it is pierced, contribute very much to the quality of the wires.

A draw-plate, to be a good one, must be made of a substance, neither too hard, nor too soft: all those which are steeled are good for nothing; and pure iron is equally unsuitable. The best material for making them, is a mixture of the best bar iron, and cast iron. These plates should be pierced, so that every hole goes on diminishing, in diameter, underneath: these holes are commenced with conical steel punches, which are struck; the draw-plate is then put to heat

in a fire of only wood, and the operation of piercing it, is afterwards completed, when cold, with steel punches. It is necessary to have punches corresponding to all the diameters of wires required to be drawn.

Manner of working.

When all the tools are ready, as above mentioned, and the iron wire is also prepared, it is put upon the reel which is placed at the end of the bench. The end of the wire is then filed, pushed through the grease box, and into the hole of the draw-plate corresponding to its size, and is drawn by hand with the pincers till it can be attached to the barrel, where it is fastened by points which are fixed for that purpose on the barrel: the barrel is then turned gently by means of its handle.

For the first course, it is necessary that the barrel which does not act should be removed, because it would be in the way of the wire coming off the reel to enter the draw-plate. When the whole wire has passed through one hole, the other barrel is put into its place, the wire is sharpened anew, the draw-plate is turned, the wire passed through the next following hole in size, drawn with the pincers, and fixed to the second barrel, which is turned by its handle, so that the wire unwinds from the first barrel, passes through the draw-plate, and winds on the second. It is necessary to take care that the wire be always passed through the grease box before entering the hole in the draw-plate.

One thing essential to be observed, is, that the wire passes through holes corresponding to its size, so as to require but little power to pull it through, consequently, the diameter of the wire is reduced but a very small quantity each time it passes through a hole in the plate.

To draw the wire of two-thirds of a line in diameter, it is necessary to anneal it twice before reducing it to one-third of a line: brought to this size, it is annealed by the method before described, and afterwards it will not require annealing to be reduced to the greatest degree of fineness. In order that the iron wire may possess the proper degree of ductility and tenacity to form a sonorous string, it must pass five or six times through the draw-plate after the last annealing. When the iron wire is reduced to the desired size, nothing more is requisite than to give it the necessary polish and white colour, that it may render clear and distinct sounds.

Polishing and whitening of the wires.

When the wire is drawn down to the proper size, the draw-plate and grease box are removed, the wire is fastened to the vacant barrel, and wound upon it, making it glide at the same time through a piece of leather previously rubbed on rotten stone. It is frequently necessary to repeat this operation to obtain a fine polish. The method of winding the wire on bobbins it is needless to describe. The size of the bobbins depends on the number desired to the pound weight.

Yellow wires.

The implements necessary for making these are the same as for the white wires, and they are used in the same manner: the only difference is in the polishing and annealing.

To obtain good yellow wires, we must employ only brass, composed of four-tenths of copper, three-tenths of old brass (*mitraille jaune,*) and three-tenths of calamine. This brass should be of a pure yellow colour; it may be procured at the manufactories in rods of a line in diameter. It is to be annealed once, by heating it in the furnace, placing it on the grate, putting white wood above and below it to obtain a clear and gentle fire. It is to be heated for an hour or two so as to be only red hot. On taking it out, it should be dipped for a moment into a boiler of hot tallow. It is afterwards allowed to cool completely, and is then passed through the draw-plate in the way already described for white wires.

The brass wire is polished by the process before mentioned, excepting that instead of rotten stone we employ red tripoli.

Strings or wires made by these methods will stand in tune a tone and a half higher than the wires of Nuremberg.*

[*Description des Brevets.*

French patent granted to M. Derepas, *of Paris, for a peculiar composition of Phosphorus Match Lights.*

Into a large flask heated in a sand bath, put eight parts of pure phosphorus, which you are to half melt, without allowing it to oxidize. After it is dissolved, add four equal parts of magnesia: mix the whole for an hour at the heat of 90 degrees of Réaumur (=234.5 F.) and moderate the fire in proportion as the operation is terminated. When cooled to from 30° to 33° (=99°.5 to 106.25,) this composition forms a sort of fat powder, which is put into bottles, and, when cold, carefully stopped. This substance forms an opaque body fit for inflaming a common match. [*Ib.*

French patent granted to Messrs. Michaud Labonte *and* Depuis, *of Paris, for the invention of a method of Plating Copper* (*cuivre*) *with Platina.*

Take 123 grammes (= 1899.6 grains) of fine silver, which you are to prepare for solution by the addition of 490 grammes (=7567.6

* It reflects but little credit on English wire drawers, that a large portion of the iron wire used by our numerous and eminent piano forte makers, is Berlin wire. It appears, however, that some manufacturers of Birmingham have been able to furnish a small supply of steel wire, said to be of superior quality in regard to tone and tenacity. During the last twenty years piano forte makers have gradually increased the diameters of their wires to obtain a fuller tone, and it is to be regretted that they have no fixed gauge of sizes generally understood. Brass wire is now commonly whitened by tinning.—Tech. Rep.

E. grains) of nitric acid at 48° (= 1.50 specific gravity, at 55° F.:) introduce them into a matrass, and expose it on a sand bath over a continued fire, till the silver is perfectly dissolved.

Afterward prepare, in a porcelain capsule, 490 grammes of white tartar, and the same quantity of marine salt. When these substances have been pulverized together, pour the solution into the capsule and stir the whole with a wooden spatula, till a perfect mixture is obtained. This composition is used for preparing the copper intended to be plated: for this purpose, the copper is first cleaned, and this composition is afterwards applied to it to whiten it. This application being made, with the assistance of a flat and very clean piece of cork, upon the metal, the latter is afterwards enveloped by a leaf of virgin silver, and exposed to the action of a well closed air furnace. Let it heat to a degree above cherry red. Apply, by means of a burnisher, and rub on the plate without taking it out of the furnace, and this will apply the substance on the copper-plate. When the whole forms only one body, pass it between laminating rollers, to give it the consistency of a solid body. This first operation terminated, the leaf of platina is prepared of the proper size for the copper-plate intended to be covered, so as to envelope it, and both are cleaned with sand, to remove any grease they may have on them, and dried with clean linen, that there may be no moisture remaining. The copper is then enveloped by the platina foil, in the same manner as it was before enveloped by the leaf of virgin silver, and submitted to the action of the same furnace as before, rubbing also in the same way with the burnisher, which applies the platina. [*Ib.*

FRANKLIN INSTITUTE.

Monthly Meeting.

The stated monthly meeting of the Institute was held at their Hall on Thursday evening, July 22, 1830.

Mr. S. J. Robbins was appointed chairman, and

Mr. F. Fraley, recording secretary pro tem.

The minutes of the last meeting were read and approved.

The following donations were presented to the Institute, viz.

By R. M. Lewis, Esq.

The 7th, 9th, 10th, and 11th Annual Reports of the Chesapeake and Delaware Canal Company.

By Matthew Carey, Esq.

British Magazine, for 1800, 2 *vols.*

Annual Reviews, and History of Literature, for 1804 *and* 1805, 2 *vols.*

Gentlemen's Magazine, and Historical Chronicle, for 1805.

Essays on Political Economy, by M. Carey.

By Isaac Hays, M. D.

The Eighth Annual Report of the Chesapcake and Delaware Canal Company.

An Address on Internal Improvements.

Mr. Hemphill's Speech on Rail-roads and Canals.

An Elementary Treatise on Mineralogy and Geology, by Cleaveland.

The Polar Star of Entertaining and Popular Science.

By Professor A. D. Bache.

Brunton's Compendium of Mechanics, with additions by Renwick.

By Professor F. Bache.

Turner's Elements of Chemistry, with notes by F. Bache, M. D.

By Mr. Judah Dobson.

Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce, 1st and 2nd vols.

A Description of the Property of the Lycoming Coal Company.

By Mr. D. M. Hogan.

Jones' Views of London, Nos. 38, 39, 40, *and* 41.

By the New York Historical Society.

The Transactions of the Society, in 5 vols.

By Mr. Charles Toppan.

A specimen of bank note engraving.

The corresponding secretary laid on the table the following works, received in exchange for the Journal of the Institute, viz.

Recueil Industriel, for February, 1830.

Bibliothéque Physico-economique, for April, 1830.

London Journal of Arts and Sciences, for May, 1830.

The Mechanics' Magazine, for April.

The Repertory of Patent Inventions, for May.

Gill's Technological and Microscopic Repository, for May.

The American Journal of Education, for June and July.

Boston Mechanics' Magazine, for June.

Mechanics' and Farmers' Magazine of Useful Knowledge, for July.

The committee appointed to draft rules and regulations for the government of the library and reading room, presented their report, accompanied by a set of regulations, which, after several amendments, was referred to a committee of three members to be engrossed, and the same committee were instructed to report rules for the government of that class of the library which is intended for circulation.

Adjourned.

S. J. Robbins, *Chairman.*

F. Fraley, *Recording Secretary, pro tem.*

On the principles which should govern the location and construction of Rail-roads. By Col. S. H. Long, United States Engineer.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—I take the liberty to offer for publication in your valuable Journal, the following observations, which, although prepared more especially in reference to the Baltimore and Ohio Rail-road, nevertheless exhibit a variety of information applicable to rail-roads in general. The principles therein advanced may be applied with equal

propriety, in the location and construction of other similar works, by changing the data and deductions according to circumstances.

S. H. Long.

Extract from the original manuscript of Col. Long, of the United States Engineers.

I. *On the transverse dimensions of rail-roads.*—The usual width of rail tracks in England, is about 5 feet from *out to out* of the rails, or 4 feet 6 inches between the rails, with the addition of about one inch for play between the flanches of the wheels and the rails; the width of the Quincy rail-road is also about 5 feet between the rails, and that of the rail-road at Mauch Chunk, 3 feet 7 inches.

We would suggest 4 feet $6\frac{1}{2}$ inches as the width between the rails of each rail track, half an inch of which is allowed for play between the rails and the flanches, and the residue for the distance between the flanches of the wheels. Also to have the width of each rail $2\frac{1}{4}$ inches, making the aggregate width of a rail track 4 feet 11 inches.

A double rail-way, of course, will require double the width just mentioned, together with a space of at least 2 feet between the inner rails of the two tracks—making the width of the double rail-way 12 feet, and in addition to the width here given, the road-way should be formed outwardly of the tracks about 3 feet on each side, for the purpose of giving a firm and stable support to the rails. Thus the entire width of the road will be 18 feet, which will admit loads occupying a width of 7 feet to pass each other on the rail tracks. In situations where additional tracks, *turns out* or *via-fuges* are required, $6\frac{1}{2}$ feet must be added for each additional track.

Two modes of construction are proposed, one applicable in situations where a solid and stable foundation can be had, and the other where embankments are necessary in forming the road bed, which may require much time in settling and consolidating. The former consists in forming the bed of the road upon the natural surface, or by excavation in such a manner as not to disturb the natural solidity of the earth; or by constructing the bed of stone, so as at once to constitute a stable foundation.

Having prepared the bed of the road, trenches 18 inches to 2 feet wide, are to be formed for the reception of stone rails resting upon broken stones; the rubble stone is to be laid in the trenches to the depth of 6 or 8 inches; and stone rails, 3 to 6, or 8 feet long, 12 to 15 or 18 inches broad, and 6 or 8 inches thick (undressed except at the ends, which must be squared so as to form a fair junction at least at their upper edges,) are then to be laid edgewise in the trenches, and adjusted to a full and equable bearing upon the rubble stone.

Paving stones reduced to the size of stones proper for the construction of a M'Adamized road, are then to be thrown into the trenches on both sides of the rails, and upon the road bed to the entire width above mentioned, raising it nearly to the upper edge of the rails. The pavement is then to be consolidated by ramming, or

by passing loaded rollers over its surface, both inwardly and outwardly of the rail-tracks—the process of consolidation being carried on till the pavement shall have become not only solid, but impervious to water, the latter of which will be effected by the detrition of a quantity of the stone sufficient to fill the interstices between the fragments; and the stone rails are then to be dressed to the width of about $2\frac{1}{2}$ inches, on their upper surface, in exact conformity to the plane of the road.

Plate rails of wrought iron in bars, 8 to 12 feet long, $2\frac{1}{4}$ inches wide, and $\frac{1}{2}$ an inch thick, are then to be applied to the stone rails, and confined by means of iron rivets $\frac{5}{16}$, or $\frac{3}{8}$ inch in diameter, and 9 to 12 inches asunder, passing through the plates and into the stone 2 to $2\frac{1}{2}$ inches, being cut at suitable lengths, and rivetted into counter sinks formed in the upper side of the rail.

In order to obviate the expansion and contraction of the plates, by heat and cold, which may be expected in this climate to amount to nearly $\frac{1}{8}$ of an inch for every 10 feet in length, it will be proper to have all of the holes perforated in the plate for the reception of rivets, except that midway of the plate, of an elliptical form, the conjugate diameter being about $\frac{1}{12}$ of an inch longer than the transverse.

Scuppers for draining the water from the surface of the road between the rails, may be formed at intervals of 3 or 4 hundred yards along the road, by leaving a space 3 or 4 inches wide between the ends of the stone rails. These spaces, or water ways, may be bridged, by a plate or bar of iron 5 or 6 inches long, rivetted to the lower side of the plate rail, and resting in notches or steps prepared for their reception in the ends of the stone rails.

The plate rail should be moulded into a particular shape on that side intended for the wheel tread. The following form is deemed appropriate, viz. the bottom of the rail flat, and $2\frac{1}{4}$ inches wide, the sides perpendicular to the base or bottom, and rising $\frac{5}{16}$ inch above it, the upper corners rounded to a quadrant on a radius of $\frac{1}{8}$ of an inch, and the top or upper surface, exclusive of the rounded corners, being curved or crowning, so as to form an arch $\frac{1}{32}$ of an inch high on a cord of two inches, so that the entire depth or thickness of the plate from its crown to its soal may be $\frac{1}{2}$ inch.

It should also have been stated in connexion with our remarks on the formation of the road, that after the plates shall have been made fast to the stone rails, any portions of the latter jutting inwardly so as to interfere with the free passage of the wheel flanches, must be removed by chipping, or otherwise reduced.

It is believed that the mode of construction above suggested, is calculated to give works of this kind a degree of stability and permanency equal to that attained by any that have ever been constructed. It has been adopted in part on the Quincy rail-way, where its efficiency has been satisfactorily tested, while the cost attending its application is far less than that unavoidable in the construction of the ordinary iron rail-way.

We take this opportunity to observe, that the application of a

cheap and durable cement—could one of a suitable consistency be devised—in adjusting the plates to the stone rails, so as to give the former an equable and fair bearing, would greatly facilitate, and render much less expensive, the construction of a rail-way in conformity to the plan proposed.

The other mode of construction alluded to, is intended to be applied merely in situations where a temporary structure is adviseable, in order to allow the substratum of the road to settle, and consolidate, before a work of a more permanent character can be advantageously substituted. It consists in grading the road in the same manner as for stone rails. But instead of trenches for the reception of the rails, &c. wooden sleepers are to be laid, 4 feet from centre to centre, transversely to the road, furnished with notches for the reception of wooden rails, and keys for confining them. The sleepers may be of round timber, or may be formed by splitting a timber tree into quarters, provided, in the former case, the diameter of the smaller end is not less than 7 inches, and in the latter, that the diameter of the log at the smaller end, before it is slitted or split, is such that it will form a square of 13 inches upon each side; their length should be at least 8 feet for each track, or 14 feet in situations where a double track is required. In cases where one or more *sidelings* are required, an additional width of 6 feet 2 inches must be added for each track. The sleepers should be of locust, mulberry, or cedar, and the keys of white ash, locust, or hard pine, the latter of which is deemed preferable on account of its adhesive and elastic consistency. The rails should be of oak, hard pine, or chesnut scantling, well seasoned, 6 inches square, neatly dressed, and 8, 12, 16, or 20 feet long, confined in the notches of the sleepers by means of the keys above mentioned. These rails, like the stone rails above mentioned, must be furnished with iron plates, of the size and description heretofore mentioned, applied to the inner edge of the wooden rail of each track, by means of nails about 3 inches long, or wood screws of a suitable length, passing through the plates, and entering the wooden rail. The sleepers and rails being laid upon the bed of the road, rubble stone or gravel is to be applied after the manner of a pavement, so as to fill the spaces between the sleepers, and form a regular and solid covering for the road bed, rising nearly to the upper surface of the rails. This mode of construction is intended to be applied solely in cases of embankment, with the view of having stone rails plated with iron, substituted for those of wood, whenever the embankment shall have settled, and acquired solidity, and the wood work shall have decayed.

Turns out, or *via-fuges* and sidelings, should be formed at intervals not exceeding a mile each, in order that carriages may pass from the main track, and leave it unobstructed while they may be detained for the discharge or reception of loading, passengers, &c. or for any other purpose. At every town or village site, and in the vicinity of points at which the rail-road is intersected by highways, double sidelings, or, one on each side of the road, should be provided

for: but in other situations, a single sideling, located between the main rail tracks, will be sufficient as a resting place for both tracks.*

In regard to the power required for the conveyance of a single load upon a level rail-road, we shall merely offer a few results deduced from experiments made in reference to this subject, in England, where it is probably better understood than in any other country.

Agreeably to experiments made by Mr. Tredgold, who employed for this purpose a set of apparatus on a small scale, a force, power, or traction of one pound, is sufficient to drag, on a horizontal road, a weight or load of 130 pounds. But Mr. N. Wood, who made his experiments on a rail-road of the ordinary dimensions and construction, ascertained that a power or traction of one pound, was sufficient to propel, on an average, 200 pounds on a level road. The resistance to locomotion on roads of the description above given, (as exemplified on the Quincy and Mauch Chunk rail-ways) is no doubt considerably greater than that on the iron roads upon which Mr. Wood experimented. On the Mauch Chunk road, the average descent is about one degree, or 92 feet per mile. The resistance thereon is such, it is believed, that the carriages would not descend of their own accord, were the declivity less than about 50 feet to a mile, whereas, were the friction no greater than that attending Mr. Wood's experiments, the declivity for spontaneous descent, would not exceed 26.4 feet in the distance of a mile. We shall accordingly assume 150 pounds as the appropriate load, for a power or traction of one pound on the contemplated rail-road, with wheels 3 feet in diameter. Agreeably to this assumption, the declivity required for the spontaneous descent of the load, will be 35.2 feet in a mile. Hence, the power of a horse being estimated at 112 pounds, the appropriate load for one horse on a level road would be $7\frac{1}{2}$ tons, and on a road ascending at the rate of 35.2 feet per mile, half that load. A more particular discussion of this subject will be attempted in the sequel of this essay.

II. *The principal impediments in the way of easy and cheap construction*, are, first, undulations upon the surface of the ground; second, ravines and water courses; third, precipices and abrupt slopes; fourth, inundations and freshets; and fifth, the ascent of hills and mountains; which last is to be regarded as an impediment in the way of transportation rather than of construction, and will be considered under our third general head. These several subjects will be discussed separately, in the order above given.

1st. Of undulations on the surface of the ground.

It is a well established principle, that in the location of rail-roads, horizontal flexures, giving to the line of the road a serpentine character, are admissible, but that vertical curvatures occasioning an alternation of ascents and descents, should be avoided as much as possible. Hence it is obvious that the line of the road should be kept, as nearly as may be practicable, in the same plane, and that

* It is to be understood that the space between the main tracks is to be enlarged, to a width sufficient to accommodate the intermediate track, contemplated by this arrangement.

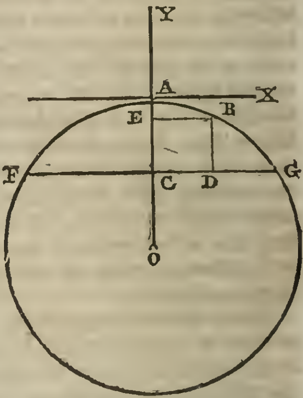
hills, and other inequalities of surface, should either be avoided by passing them in a circuitous direction, or by *deep cuts* and embankments, or bridges leading across them. As to the preference to which either of these modes of traversing an undulating surface may be entitled, it will depend in a great measure upon the following circumstances, viz. the extent of the contemplated work, the amount of capital to be invested in its accomplishment, the amount of travel and transportation to be provided for; and the despatch with which they are to be executed. In reference to this subject, however, it may with propriety be observed, that in this country, where the field for improvements of the kind under consideration is unbounded, and examples of construction exceedingly rare, the safest mode will be that which consists with the greatest economy of construction, or in other words, that, whenever the expense of avoiding a hill or valley, by a prolongation of the route, in a manner to maintain a uniformity in its vertical direction, is less than that of *cutting* and *filling*, in order to preserve the same uniformity, the former should be preferred, and *vice versa.* This manner of deciding upon the merits of a route, seems the more plausible and proper, on account of the facility always afforded by rail-roads, of making improvements both in their location and construction, at any period subsequent to their primary establishment.

It is proper on this occasion, to offer a few remarks on the curvatures admissible in the location of a rail-road; a subject that seems seldom to have attracted the particular notice of authors who have treated of works of this nature. Agreeably to the best intelligence that can be had of those who have visited and examined the rail-roads of Great Britain, it is believed that curvatures of a radius not exceeding 250 or 300 feet, are frequently to be met with in that country. On the Quincy rail-way, near Boston, Massachusetts, the least radius of curvature is said to be 300 feet. On the Mauch Chunk rail-road, the most abrupt curvature on the main line is that indicated by a versed sine of 22 inches, to a chord of 80 feet, which is equal to a radius of about 437 feet. Curvatures of any radius, however great, are nevertheless to be regarded as defects in rail-roads, but it is at the same time manifest, that the inconveniences attending them become less, as the lengths of the radii increase, and become quite imperceptible, when the radius has an extent of five or six hundred yards. The inconveniences alluded to, in addition to an increased length of road, results mainly from the difference of the length between the interior and exterior rails of the curve; which, from the manner usually observed, in constructing rail-road carriages, occasions a longitudinal sliding or friction equal to that of dragging half the load without wheels through a distance equal to the difference in the length of the rails. It is believed, however, that this difficulty may be obviated almost entirely by a different arrangement in the construction of carriages.

The following tabular statements, having for their object, not only the dimensions of curves, but the means of applying them in the location of a road, will conclude our observations under this head.

The statements alluded to have been prepared by Mr. Guion, assistant civil engineer, as exhibited in the following communication.

Sir,—Agreeably to your request, I herewith furnish you with a mode of describing arcs of circles, of known curvatures, by a series of points, determined from the length of ordinates to given abscissas, or portions of the assumed chord; to which is affixed a tabular form, displaying the radii, versed sines and ordinates, of four circles, corresponding to a constant chord of 100 inches, feet, or yards; the abscissas beginning at the middle point and increasing by 5, on either side, to 50.



The curvature being assumed, the radius and versed sine corresponding to the given chord, will be known.

Then let AO $= r = 626$, CG $= 50$, AC $= 2$, AE $= x$, EB $= Y$. Then when the point B is referred to A as the origin of co-ordinates, the equation of the circle is $y = \sqrt{2\,r\,x - x^2}$ or $x = r - \sqrt{r^2\,y^2}$ from which to determine the same point when referred to C as the origin, drawing BD perpendicular to CG, we have CD $=$ EB $= y =$ successively 5, 10, 15, etc. to 50; and BD the required ordinate $=$ EC $=$ AC $-$ AE $= 2 - x$. Then determining x from the equation $x = r - \sqrt{r^2\,y^2}$, in which y and r are known, BD found.

To find x, we have $r - x = \sqrt{r^2\,y^2}$

$$L\,(r - x) = \tfrac{1}{2}\,L\,(r^2\,y^2)$$

$$r^2\,y^2 = 391851 \text{ for 1st five feet.}$$

$$\text{then } L\,(r - x) = 2.796\;5605$$

$$r - x = 625.98$$

$$x = 626 - 625.98 = .02$$

And BD $= 2 - x = 2 - .02 = 1.98$. In the same way will be found the remaining ordinates; the last one being, of course, equal to zero.*

Very respectfully, &c.

(Signed,) W. B. Guion.

To Col. S. H. Long.

2nd. Of ravines and water courses.

This head is intended to embrace all situations where culverts and bridges are required, in the formation of a road. In the construction of these appendages, two things are to be considered, viz. an extent of span sufficient to admit a free passage of the water under them; and a height corresponding to that of the *plane* traversed

* For a more full and satisfactory method of locating curves, and computing the lengths of ordinates, see Long's "Rail-road Manual," published in 1829.

by the road. In reference to culverts, it is proposed to construct them of stone, none of them having a span greater than 10 feet. The culverts may be divided into two classes, viz. those of six feet and upwards, to be formed of abutments and arches, constructed in the usual manner, of stones laid in grout or mortar; and those having a span less than six feet, to be constructed after the manner of the gothic culverts on the national road, westward of Wheeling.

With respect to bridges, it is proposed to construct them of timber resting upon stone abutments and piers, yellow pine being most convenient, and best adapted to this purpose. It is also proposed, as above intimated, to erect bridges of this character, in all places where a water way more than ten feet wide is required. The reasons for preferring wooden bridges, are briefly as follows: their prime cost is so much less than that of stone bridges; the interest on the additional capital required for the latter, is sufficient to keep wooden bridges in complete repair; stone bridges are more liable to injury from frost, the dilapidating effects of which cannot always be remedied. Any derangement in the line of the road, occasioned by the settling and consolidation of the abutments and piers, can be more easily rectified, when the bridges are of wood, than when they are of stone; any necessary repairs can be more easily made on the former, than on the latter, and with less obstruction to the travel and traffic.

The mode of construction deemed most applicable, is that adopted by Mr. Wernwag, so far as relates to the formation and adjustment of the main arches. The flooring of the bridge must be either horizontal, or slightly inclined, and may be located either in coincidence with the chord, or at any elevation above or below it, and may be sustained either by stirrups depending from the arch, or struts connected thereto.

In order to facilitate repairs, and afford the best opportunity for renewing the bridge, it is proposed to support each rail track upon two arches; the width allowed therefor being 10 feet, or the entire width for both tracks 20 feet, which will afford sufficient room for a foot way, between the tracks. The inside arches of the rail-ways, may be united to each other by temporary fastenings, which being detached, the road-ways will be independent of each other, and either of them may be repaired or renewed while the other remains firm, and may subserve the purposes of travel and transportation.

As to the other dimensions, quantity of materials, &c. necessary in the construction of bridges, so much is dependent on the locality, height, and length of the spans, that no estimate in reference thereto will be attempted on the present occasion.

3d. Of precipices and abrupt slopes.

Any route leading across the Alleghany mountains, must unavoidably be attended by numerous impediments of this nature. Those most formidable are the rocky and precipitous banks of the streams, which often present perpendicular fronts of great height, while their immediate bases are washed by copious streams, occa-

sionally swelling into torrents. The passage of these by a rail-road must necessarily be effected at great expense, in procuring sufficient space for the road-way, and in preparing the foundation of the road.

To the difficulty of forming the road-bed, in situations of this kind, may be added that of securing the work from avalanches of earth or stones, to which it will be more or less exposed, and which cannot well be guarded against, by any other method than that of increasing the width of the road. This is to be effected mainly by erecting side walls of greater or less height, for the support of the road, and by forming a broad drain between the rail track and the hill side, sufficiently large for the reception of the earth and stones, that may slip from the surface of the hill.

4th. Of inundations and freshets.

Perhaps no part of the work will be attended with greater difficulty, or require more care in the execution, than that of raising the road above the reach of freshets, and protecting it from the violence of currents of water. In numberless instances, the low grounds and flats contiguous to water courses, and subject to inundations, must unavoidably be traversed by the road, which in such instances must be elevated to a considerable height above the surface of the ground. In other situations, the road must be conducted along the sides of precipitous shores, against which the current, especially in a high stage of water, impinges with great force, in which case strong walls, based on the bed of the river, and rising to the utmost height attained by the stream when swollen by a freshet, must be formed of heavy stones; and in situations where it is exposed to the action of drift and floating ice, it may be necessary to confine the stones together by means of iron clamps.

The ranges from extreme low to extreme high water, vary from 10 to 40 feet, requiring walls of a corresponding height, for the support and protection of the road. It is believed that these walls, in order to withstand the action of the frost, and sustain, without yielding, the weight of the materials of which the road is formed, ought to have a thickness, at top, of at least 18 inches, and a batter or talus on their fronts of about $\frac{1}{5}$ of the height. Hence the base of a wall 10 feet high, should be at least $3\frac{1}{2}$ feet thick, and that of a wall 30 feet high should be $7\frac{1}{2}$ feet thick, and in due proportion, when different heights are presented.

III. The passage of hills and mountains, of an extent and elevation too great to be traversed by a deep cut, or perforated by a tunnel, must be regarded as the most serious impediment in the way of easy transportation. The difficulties that present themselves in view of this subject, are those attendant upon ascents, in which a portion of the gravity of the load is to be overcome in addition to the friction, as heretofore stated, and those attendant upon descents, where the gravity in the direction of the line of descent, is greater than the resistance by friction. In the former case the power required for locomotion must be increased in due proportion to the angle of ascent, and in the latter, the excess of gravitation above the friction must be counteracted by suitable brakes or convoys, in

order to prevent the too rapid descent of the load. In reference to the former, it may also be observed, that the advantages of a rail-road over those of an ordinary turnpike, decrease as the angle of ascent increases; or, in other words, that these advantages become less, in proportion as the gravity in the direction of the inclined plane increases, or as the portion of the load sustained by the plane diminishes; and in reference to the latter, that when the descent exceeds 35.2 feet per mile, brakes attached to the carriage, and acting upon the peripheries of the wheels, will be adequate to the retarding and regulating of the descent, in all states of the weather, frost and snows excepted, provided the declivity does not exceed an angle or declination of three degrees; also, that in all cases of a more abrupt descent, stationary convoys or brakes must be employed, in order to regulate the speed of a descending load. In regard to the means of overcoming ascents, they will be more or less expensive in proportion to the absolute height to be attained, except in cases where an *adequate water power* may be conveniently had for that purpose; while those of descending, in addition to the cost of suitable convoys, will simply be attended by the expense of conveying the motive power, or the means of generating it, from the top to the bottom of the declivity unincumbered with a load; which in case of horses being employed on the inclined plane, will be considerable, but in cases where the ascent of the plane is overcome by stationary machines propelled either by steam, horses, or water, this inconvenience may be avoided. In conformity to the intention heretofore expressed, it will be proper on this occasion, to explain more fully our views in reference to the application of motive power, and the mode of estimating it, not only in relation to the ascent of inclined planes, but to the conveyance of burdens upon a level road. It has already been stated, that a power of one pound, acting horizontally, is regarded as adequate to the conveyance of 150 pounds on a level rail-road of the description heretofore given. The means of generating this or any other amount of power, and the velocity with which it is to act, now claim some attention. In regard to the former, three varieties are presented, viz. animal, steam, and water power; the first and second being applicable, not only through the medium of stationary machinery, but in a manner to partake of the locomotion of their load, and the third, applicable only by means of stationary machinery. Horses and mules, the latter being esteemed more hardy, more easily subsisted, and equally efficient, though less rapid in their movements than horses, seem to be the only animals hitherto employed on rail-roads. Various degrees of strength have been attributed to these animals, and especially to the horse, whose powers have been variously estimated, by authors who have experimentally investigated this subject, with the view of ascertaining the average amount of labour that can be performed by a horse to the greatest advantage. These investigations have induced a variety of results, the mean of which appears to be as follows, viz. that the force, stress, or traction, of a horse moving at the rate of 2 miles per hour, during 10 hours of each day, is equal to 112 pounds; also,

that when the daily duration of his labour is less than 10 hours, the degree of traction will be proportionably greater, till it amounts to about 200 pounds, and when his movements are accelerated beyond the speed of 2 miles per hour, his power will be proportionably diminished.

In order to place this subject in a clearer point of view, we shall here insert, in a tabular form, a few of the conclusions drawn from a great variety of experiments, as recorded by Mr. N. Wood, in his "Practical Treatise on Rail-roads;" by Mr. T. Tredgold, in his Treatise on the same subject, and by Professor Leslie, in his Elements of Natural Philosophy. The following table exhibits the greatest useful effect of the labour of a horse moving at different rates of speed, as deduced from the works of the judicious and ingenious authors, above cited.

WOOD.				TREDGOLD.				PROF. LESLIE.			
Speed in miles per hour on a level rail-road.	Daily distance in miles performed by a horse.	Power of 1 horse moving with different velocities.	Daily duration of labour in hours.	Speed in miles per hour on a level rail-road.	Daily distance performed by a horse.	Power of 1 horse moving with different velocities.	Daily duration of labour.	Speed per hour on a level rail-road.	Daily distance travelled by a horse.	Power of 1 horse moving with different velocities.	Daily duration of labour.
Miles.	Miles.	Poun's	H'rs.	Miles.	Miles.	Poun's	H'rs.	M'ls.	M'ls.	Poun's	H'rs.
2	20	112	10	2	18	125	9	2	20	100	10
3	20	$74\frac{2}{3}$	$6\frac{2}{3}$	3	18	$83\frac{1}{3}$	6	3	20	81	$6\frac{2}{3}$
4	20	56	5	4	18	$62\frac{1}{2}$	$4\frac{1}{2}$	4	20	64	5
5	20	$44\frac{2}{3}$	4	5	18	50	$3\frac{3}{5}$	5	20	49	4
6	20	$37\frac{1}{3}$	$3\frac{1}{3}$	6	18	$41\frac{2}{3}$	3	6	20	36	$3\frac{1}{3}$
7	20	32	$2\frac{6}{7}$	7	18	$35\frac{5}{7}$	$2\frac{4}{7}$	7	20	25	$2\frac{6}{7}$
8	20	28	$2\frac{1}{2}$	8	18	$31\frac{1}{4}$	$2\frac{1}{4}$	8	20	16	$2\frac{1}{2}$

The discrepancies between the statements of the table, so far as relates to the views of Messrs. Wood and Tredgold, are very inconsiderable. The expressions indicating the power of a horse at different rates of speed, may be regarded as practical deductions, from experiments made with the utmost care and precision for the purpose of ascertaining the "*greatest useful effect*" resulting from the labour of that animal. The statements ascribed to Professor Leslie, are made agreeably to the formula furnished by that gentleman, for computing the power of a horse at different velocities, and are to be regarded rather as theoretical than practical.

It may be inferred from the foregoing table, that a horse, moving at the rate of 2 miles per hour, is able to communicate a force twice as great as when he moves at the rate of 4 miles an hour, and four times as great as when he moves with a speed of 8 miles per hour. Or, that the number of horses required to drag a given load, must be doubled when the speed is doubled. This rule, however, is only

applicable to velocities above that at which a horse can exercise his full strength to the greatest advantage, which is supposed to be the case when he travels at the rate of about 2 miles per hour, as before mentioned.

A course of reasoning, somewhat analogous to that we have been pursuing, is also applicable to the ascent of inclined roads, where a portion of the horse's gravity, as well as that of his burden, constitutes a part of his load. If we suppose the weight of a horse to be 800 pounds, and the angle of ascent 8 degrees, the force exerted by the horse in ascending without a load is equal to 112 pounds, the same as that required to propel $7\frac{1}{2}$ tons on a level rail-road as heretofore stated. Accordingly, that portion of the power of a horse applicable to the conveyance of a load, over and above that which is necessary to his own progression upward on an inclined road, varies in due proportion to the angle of the ascent, till it vanishes or becomes extinct at an angle of about 8 degrees.

However discordant with common experience may seem the opinions we have advanced, both in relation to the power of a horse moving at different rates of speed, and in ascending inclined roads, yet it is confidently believed that they are correct, in so far as they relate to the "*greatest useful effect*" resulting from the labours of that animal; his welfare, duration of life, and continuity of service being equally consulted.

Notwithstanding the principles adverted to in the foregoing discussion, and the propriety of regarding velocity of movement, duration of labour, and degrees of acclivity as elements materially affecting any practical results that may be deduced in reference to the questions that have just been agitated, and especially to the application of animal power; yet for the sake of simplifying our calculations as much as possible, and divesting them of minute and intricate details, we shall regard the power of a horse as equal to a stress or traction of 112 pounds, moving at any desirable velocity, whether upon a level, or upon an ascending road. This view of the subject is altogether appropriate, with respect to the application of mechanical power, and is equally so with respect to animal power applied through the medium of stationary machinery; due allowance being made in both cases for the friction of the ropes and other extra machinery necessarily employed.

A system of graduation, corresponding to such an inclination in the rail tracks, that a given power may be sufficient to propel, in addition to the carriages, five times the amount of tonnage in the direction of the heaviest trade as in that of the lightest trade, now claims our consideration.

Were it possible to construct a rail-road, throughout its whole extent with a uniform graduation corresponding to the amount of tonnage in opposite directions, whatever might be the motive power required for the traffic, the graduation would still be the same. When, however, such an arrangement is utterly impracticable, we must of course resort to such a system of graduation as the nature of the case will admit, keeping in view economy of construction and

transportation, facility and despatch in both, the accommodation of the public, together with an adequate profit to the stockholders, upon their investments. In accordance with these views, we present the following system of graduation, to be adapted to the location of the road, according to the circumstances affecting the condition of the route, with respect to ascents and descents, and in conformity to the state of trade thereon, which, as before mentioned, is assumed to be in the ratio of 1 to 5.

1st. Of the graduation adapted to the state of trade to be adopted in all cases where the natural surface has an inclination corresponding thereto. The object in view, under this head, is, to determine the degree of ascent or acclivity, at which the relative amounts of transportation may be attended with equal resistance in both directions. The elements upon which any calculation of this nature must be based, are as follows, viz. The proportion between the outward and return transportation, which we shall assume at the ratio of 1 to 5, which is intended to imply, that for every ton conveyed westward, five tons will be conveyed eastward; the proportion of the weight of a carriage to that of its full load, which we shall estimate in the ratio of 1 to 3, implying that a carriage weighing one ton may be made sufficiently strong for the conveyance of a load weighing three tons; and, the ratio of the weight or load, to the power necessary to propel it, which we shall assume as heretofore stated, as 1 to 150, implying that a traction of one pound is sufficient to propel on a level rail-road, a load of 150 pounds.*

The result deducible from the foregoing data, is, that the inclination of the road will be at the rate of 15.086 feet per mile, or 9.8 minutes of a degree.

Inasmuch as the natural surface of the ground will not always admit of a location in accordance with the results above stated, we are compelled to resort to a more complicated system of graduation, in order to effect an economical construction of the road by adapting its location to the natural surface, in such a manner as to avoid as much as possible, deep excavations and high embankments, and at the same time render the application of motive power, whether animal or mechanical, more easy, uniform and systematic. For these purposes we shall exhibit in a tabular arrangement, a series of statements based upon the data assumed agreeably to the views advanced in the preceding articles, and embracing results sufficiently varied for ordinary purposes.

* In reference to the friction of carriages upon rail-roads, subsequent experience has taught, that the ratio of the resistance upon a horizontal rail-road substantially constructed, to the load is as *one to two hundred.* Accordingly the declivity for spontaneous descent will be at the rate of 26.4 feet per mile, and that corresponding to a reciprocal traffic, where the outward is to the return transportation as 1 to 5, will be at the rate of 13.2 feet per mile.

Hence corresponding changes in the "table of graduation" hereinafter to be given, may with propriety be introduced.

Table of graduations, computed for equal resistance in both directions.

OUTWARD TRANSPORTATION. Weight of carriages, 3.28125 tons. Do. of freight, 1.96875 tons. Amount of friction, 0.03499 tons.						Amount of resistance or power required for transportation in either direction.		RETURN TRANSPORTATION. Weight of carriages, 3.28125 tons. Do. of freight, 9.84375 tons. Amount of friction, 0.08799 tons.					
Statements.	Horses.	Inclination of plane in feet per mile.	Inclination of plane in degrees and minutes of a circle.		Gravity of the load, or its tendency to descend, expressed in parts of a ton	Resistance in parts of a ton.	Resistance in pounds.	Gravity of the load, or its tendency to descend, expressed in parts of a ton	Inclination of plane in degrees and minutes of a circle.		Inclination of plane in feet per mile.	Horses.	Statements.
No	No	Feet.	dg.	min.	prts of a ton.	Ton.	Po'nds.	prts of a ton.	dg.	min.	Feet.	No	No
1	0	35.2	0	22.9	0.035			0.088	0	22.9	35.2	0	1
2	1	15.08	0	09.8	0.015	0.05	112	0.038	0	09.9	15.08	1	2
3	2	65.37	0	42.5	0.066	0.10	224	0.012	0	03.2	5.02	2	3
4	3	115.65	1	15.3	0.115	0.15	336	0.062	0	16.3	25.14	3	4
5	4	165.94	1	48.0	0.165	0.20	448	0.112	0	29.4	45.25	4	5
6	5	216.22	2	20.8	0.215	0.25	560	0.162	0	42.5	65.37	5	6
7	6	266.51	2	53.5	0.265	0.30	671	0.212	0	55.6	85.48	6	7
8	7	316.79	3	26.3	0.315	0.35	748	0.262	1	08.7	105.59	7	8
9	8	366.08	3	59.0	0.365	0.40	896	0.312	1	21.8	125.71	8	9
10	9	416.37	4	31.7	0.415	0.45	1008	0.362	1	34.9	145.82	9	10
11	10	466.65	5	04.5	0.465	0.50	1120	0.412	1	48.0	165.94	10	11
12	11	516.94	5	37.2	0.515	0.55	1232	0.462	2	01.1	186.05	11	12
13	12	567.22	6	10.0	0.565	0.60	1344	0.512	2	14.2	206.17	12	13
14	13	617.51	6	42.7	0.615	0.65	1456	0.562	2	27.3	226.28	13	14
15	14	667.79	7	15.5	0.665	0.70	1568	0.612	2	40.4	246.40	14	15
16	15	718.08	7	48.2	0.715	0.75	1680	0.662	2	53.5	266.51	15	16
17	16	768.37	8	21.0	0.765	0.80	1792	0.712	3	06.6	286.62	16	17

In explanation of the foregoing table, we shall merely observe, that the elements from which it is computed, are introduced into the body of the table under the heads of outward transportation and return transportation, and that the several subdivisions into columns, are sufficiently explained by their respective *captions.*

It is proper to state, on this occasion, that in cases where a stationary steam engine, or other stationary power, is employed in the ascent of inclined planes, the number in the column headed "Horses," will indicate the numerical amount of horse power required for that purpose, on any inclination corresponding thereto, additional allowance being made for the friction of the ropes or chains, rope-rollers, &c. necessarily employed in connexion with stationary machinery.

In respect to the employment of steam power, we shall further observe, that fuel is to be regarded as its generating medium, and may with propriety be substituted for horses and their subsistence. This view of the subject will appear the more plausible, when it is understood, that the prime cost of a steam engine competent to perform the labour of 5 horses actually hitched, or that of 12 horses continuously, due allowance being made for intermission of their labour, will not exceed that of the horses necessary for the performance of the same labour, even at a speed of only 2 miles per hour.

If the speed be accelerated to 4 miles per hour, the same engine will be able to perform the labour of 24 horses; and with a speed of eight miles per hour, it will be able to perform the labour of 48 horses. However paradoxical these opinions may seem, they are nevertheless grounded upon the practical results drawn from experimental facts by Messrs. Wood, Tredgold, and Leslie, as stated in our tabular exhibit of the power of a horse moving with different velocities. In order to furnish a more clear illustration of this subject, we will add that the traction or draft of an engine being equal to 560 pounds, or the power of 5 horses, the former working continuously, and the latter only 10 hours of each day, the efficiency of the engine will be equal to that of the continuous labour of 12 horses, when the speed is only 2 miles per hour.

Again, the engine can move with a speed of 4 miles per hour, exercising a traction of 280 pounds continuously, whereas, the speed being 4 miles per hour, the daily duration of a horse's labour is only 5 hours, and his power of traction 56 pounds, consequently it will require 24 horses to perform the labour of the engine.

Again, the engine can move with a speed of 8 miles an hour, exercising a traction of 140 pounds continuously; whereas, the speed being 8 miles per hour, the daily duration of a horse's labour is only $2\frac{1}{2}$ hours, and his force of traction 28 pounds, consequently it will require 48 horses to perform the labour of the engine.

N. B. The expense of steam will be precisely the same in all the cases above mentioned. It should moreover be observed, that in the foregoing comparisons, horses are regarded as moving with their loads at the several rates of speed therein mentioned, but that the steam power may act through the medium either of a locomotive or stationary engine.

Hence, although it may be questionable, whether animal or steam power should have the preference, in a slow movement, yet with a speed of 4 miles per hour and upwards, there can be very little doubt that the latter will prove most economical.

As to the quantity of fuel necessary to convey a given load through a given distance, it has been customary to allow one pound of coal, or $\frac{1}{86}$ part of a bushel, for the conveyance of a ton, through the distance of one mile on a level road; accordingly $7\frac{1}{2}$ pounds per mile will be expended in conveying the load of one horse, or 150 pounds, which is equal to about $1\frac{3}{4}$ bushels, may be regarded as about equal to the daily performance of a horse, on a horizontal rail-road.

The former of these quantities, viz. $7\frac{1}{2}$ pounds, being multiplied by the number of horses, corresponding to any given inclination in the tables of graduation, will give the quantity of coal required for the ascent of a plane of that inclination, whose length is one mile. Or, the quantity of coal required in surmounting heights, will be at the rate of one pound per ton for every 35.2 feet of elevation, in addition to what may be required to pass through any given distance upon the road.

In regard to the employment of water power, as a substitute for stationary steam power, there can be no doubt of its being attended

with very great advantages, in situations where a sufficient supply of water can be had at a suitable height.

The quantity required, must be about equal in weight to the tonnage passing upwards upon the road, at the place where a stationary power is required, provided the water can be employed in such a manner as to act through a perpendicular distance, equal to that through which the load is to be conveyed. In case the perpendicular distance is less, the quantity of water must be proportionably greater, but in case it is greater, the quantity will be proportionably less than the amount of tonnage ascending the inclined plane.

On the Manufacturing of Indigo in the United States. By WILLIAM PARTRIDGE.

THE value of the indigo consumed in this country, for the year 1829, cannot be estimated at less than two millions of dollars.

Of the quantity consumed, there was made in the United States about two hundred thousand pounds, or one-tenth part of the consumption.

As the consumption is rapidly increasing, from the increase of population, from the extension of manufactures already established, and from the introduction of new articles of manufacture, I consider it an object of national importance, that it should be better made, and more extensively cultivated in this country.

I have been acquainted with the indigo market for more than thirty years, and never remember it in so depressed a state as it has been for the last twelve months. The average price of the sales for the last year cannot have been much over one dollar per pound. The average price of the imported has been about one dollar and fifteen cents, and of that made in this country, about fifty cents. To endeavour to give such instruction to the planters as will enable them to make an article fully equal to the imported, is the object of this communication.

The quantity of indigo made from an acre of the plant, has been differently estimated by almost every maker from whom I have obtained information. Gen. Wade Hampton, who many years since made the article in South Carolina, informed me that he obtained sixteen pounds of fine indigo from the plant taken from a half acre, or thirty two pounds per acre. Other estimates make the quantity much larger, some nearly two hundred pounds to the acre. Taking the average of the different estimates, it would be at least fifty pounds. It will appear by this estimate, that it would require forty thousand acres of land to raise a supply for the present consumption; and as the demand is rapidly increasing, it is more than probable, that in ten years, it will require the product of eighty thousand acres to raise a supply for home consumption.

There are four points to be attended to in the making of indigo, which require much judgment, aided by practical skill. These are,

the time of cutting the plant, the degree of fermentation to be given in the steeper, the degree of oxidisement of the colouring feculæ, and the extrication of foreign matter from the pulp after the indigo is made. Three of these processes being purely chemical, it is not, therefore, surprising, that ordinary workmen should frequently fail in producing a good article. There is probably more loss sustained by our planters, from the ignorance of the operators, than the whole value of the article now sold.

The plant should be cut when at maturity, as it will then afford a fine colour; but if cut too late, a portion of the colour is then lost, and an indigo of worse quality is obtained. Mr. Dalrymple informed me, that the plant should be cut when in full flower, after the weather for some days has been dry.

Another celebrated maker of indigo, asserts, "that if the plants are suffered to stand till they run into flower, the leaves become too dry and hard, and the indigo obtained from them proves less in quantity and less beautiful—the due point of maturity is known by the leaves beginning to grow less supple, or more brittle.

It appears, that the makers of indigo differ as to the time of gathering the plant. It is greatly to the interest of our planters that they should ascertain, by direct experiment, the proper time of gathering the plant.

When the plant is gathered, it has to undergo a process by immersion in water, for the purpose of extracting its colouring matter. This operation is performed in two ways—by fermenting the green plant in a steeper, or by first drying the leaves and then simmering them in a boiler. The latter process is now pursued by some of the best makers in Bengal, and has apparently an advantage over the old process.

When the green plant is fermented in a steeper, and the process is carried a little too far, the colouring matter will become dark, and is said to be burnt—if carried a slight degree farther, it will be black, and of course the indigo will be very much injured. Nine-tenths of the indigo made in the United States partakes more or less of this character, and has evidently been injured by an excessive fermentation. To observe a due degree of fermentation in the steeper is the most difficult point in the whole process of making indigo; for should not the fermentation be carried far enough, a considerable loss of colouring matter will be the result. It is necessary, therefore, to carry it on to a certain point, and to draw it off the instant it arrives at that point; and this can be known only by a skilful observer who has obtained his knowledge by practice.

There is no chemical operation so difficult to describe as that of fermentation, and I almost despair of making myself clearly understood by practical workmen in the following description of the steeping process.

Fermentation has been divided by chemists into four kinds, the panary, vinous, acetic and putrefactive. The kind of fermentation given in the indigo steeper is evidently of that kind called panary, or the first stage of fermentation. It is known to be the panary by

the large quantity of carbonic gas given out, which rising to the surface, floats on the top, covered with a thin pellicle of the liquid. The difficult point for the operator to distinguish, is when it arrives at that degree of fermentation, and begins to assume the acetic. The same difficulty occurs with the woollen blue dyer, and the losses so frequently complained of, by the vats being out of order, and often irrevocably lost, arise from the fermentation being permitted to proceed too far.

The following directions are given as a guide for those who may be engaged in the making of indigo. Whilst the plant is in steep, draw off a little of the water, and with a pen dipped in it make a few strokes on white paper. The first will probably be high coloured, in which case the indigo is not sufficiently fermented. This operation is to be repeated every quarter of an hour, until it loses its colour, when it will have arrived at its true point of fermentation.

Let a small hole be made in the steeper, six or eight inches from the bottom, exclusive of the opening or aperture, for drawing off the impregnated water. Let this hole be stopped with a plug, yet not so firmly but that a small stream may be permitted to ooze through it. After the plants have been steeped some hours, the fluid oozing out, will appear beautifully green, and at the lower edge of the cistern, from whence it drops into the battery, it will turn of a copperish colour. This copperish hue as the fermentation continues, will gradually ascend upwards to the plug, and when that circumstance is perceived, it is proper to stop the fermentation.

During the progress of this part of the business, particular attention should be paid to the smell of the liquor which weeps from the aperture, for should it discover any sourness, it will be necessary to let the fermenting liquor run immediately into the battery, and lime water of sufficient strength must be added, until it has lost its sourness. As it is running off it will appear green, mixed with a bright yellow or straw colour, but in the battery it will be of a beautiful green.

Another maker has given the following description of the fermenting process:

When the plant is gathered, a large quantity is put into a vat, and some wood laid above to prevent its rising above the water. The mass begins to ferment sooner or later, according to the warmth of the weather, and the maturity of the plant—sometimes in six or eight hours, and sometimes in not less than twenty. The liquor grows hot, throws up a plentiful froth, thickens by degrees, and acquires a blue colour inclining to a violet—at this time, without touching the herb, the liquor impregnated with the tincture is let out, by cocks in the bottom, into another vat placed for that purpose, so as to be commanded by the first.

The boiling process, for extracting the colour from the dry plant, was obtained from Mr. Dalrymple, who had for many years been an extensive indigo maker in Bengal. He says, "take an iron, brass, or copper boiler, fill it within three inches of the top with the plants, press down with stones, and cover the plants with water.

The liquor must be heated, not until it boils, but until it begins to blubber, or simmer. The water, by this time, will look greenish, then draw it off into a shallow vessel, or vat, and beat for one or two hours to incorporate oxygen with it. On taking some of the liquor in a white saucer, little particles will appear in it as big as a pin's head, and smaller, then stop beating and throw in a little lime water, upon which the indigo will precipitate to the bottom, and the supernatant water will look like brandy. The water has now to be drained off to a level with the top of the sediment, lay the sediment on a cloth to drain, and when stiff enough put it into moulds to dry."

The directions given by Mr. Dalrymple are evidently imperfect, for none are given for the fermentative process, and those who are in the least acquainted with the manufacture of indigo, must know, that the colouring matter cannot be developed unless the liquor has previously undergone a due degree of fermentation.

I have been recently informed, that many first rate makers of indigo in Bengal, condemn the process of obtaining it from the dried leaves, on the plea that the article obtained is no better, and is much less in quantity. If any of our planters should be disposed to try the dry process, it will be necessary to inform them, that should the leaves, between gathering and drying, be subject to fermentation, only a small portion of colouring matter will be obtained, and that the loss sustained will be as the degree of fermentation.

During the precipitation of the colouring feculæ, the coarsest particles, possessing the greatest specific gravity, subside first, constituting the lower strata of the pulp, and the lighter and finer particles subsiding the last, form the upper part. It is necessary that indigo makers should take advantage of this circumstance, by first taking off the upper layer, and moulding it by itself, and the lower part by itself. By this means they may obtain several qualities of indigo from one mass of pulp.

It appears from analysis made by Bergman, Quatremere, and other chemists, that indigo of good quality does not contain more than from 46 to 47 per cent. of colouring matter, and that the very best samples do not contain more than 48 per cent.

The following table will exhibit an analysis of indigo of a good quality, and of the menstruua in which the impurities are soluble.

Mucilaginous parts separable by water, - - -	12
Resinous parts soluble in alcohol, - - - - -	6
Earthy parts soluble in acetic acid, - - - -	22
Oxide of iron soluble in muriatic acid, - - - -	13
Colouring parts almost pure, - - - - - -	47
	100

There cannot be a doubt, that manufacturers of indigo might produce, by attending to the analysis made by chemists, an article far superior to any hitherto offered to the public. It will also appear certain, when experience shall have confirmed the value of a superior indigo, that a more than remunerating price could be obtained for a purer article. For certain purposes a pure indigo would command

double, and even treble prices, provided the supply were not too great for the consumption. This being the case, it would be well for our manufacturers to pay some attention to the subject, and endeavour, by some easy unexpensive process, to bring it to as great perfection as possible. To promote this subject, I offer the following extracts and observations.

Bergman dissolved, by means of ebullition in water, a ninth part of the weight of indigo.

Quatremere also separated, by means of water, the parts which are soluble. He states their quantity to be more considerable, the worse the quality of the indigo; and that, after this operation, the residuum has acquired the qualities of the finest indigo. He therefore proposes to purify what is of inferior quality, by boiling it in a bag, and renewing the water till it ceases to acquire colour.

If sulphuric acid be diluted with water, it attacks only the earthy matter that is blended with the indigo, and some mucilaginous ingredients.

Muriatic acid digested, or even boiled with indigo, takes up the earthy part, the iron, and a little extractive matter, which colours it yellowish brown, but without attacking in any manner the blue colour.

It is evident from the analysis, that to make indigo far superior to any now brought to market, requires only an application of known facts to the art of making it. It is a well ascertained fact, that if indigo be boiled in water containing muriatic acid, twenty-five per cent. of the impurities contained in the best samples would be extracted, and that the colouring matter remaining would form an indigo far superior to the best now offered for sale.

The best Bengal indigo, and I never remember it in a more depressed state, is worth, wholesale, one dollar eighty cents per pound. The average value of all the indigo imported from foreign countries is about one dollar and fifteen cents per pound, whilst the average value of that made in the United States is not more than fifty cents, and this great difference in the value is owing almost entirely to the great impurity of the article. The first object with our manufacturers, therefore, should be to make their indigo equal in quality to the best Bengal, and the second to go as far beyond them as is practicable.

In the best samples of the indigo of this country, there is evidently too much extractive matter, and there is no doubt that this defect arises, in a great measure, from their taking the pulp from the beater, instead of their running it into a vat of clear water, and after well agitating it there, letting it settle in the third vat. This third receiver should undoubtedly be added where it has not been already done. Those manufacturers who would wish to avoid the expense of a third receiver, may fill up the beater with fresh water, after drawing off the first liquor, and perform the operation in the same vat.

The greatest improvement I can at present suggest, would be to boil the pulp taken from the vat by steam heat, for fifteen or twenty minutes, in water containing as much muriatic acid as would give to

the liquor a strong acid taste. This operation can also be performed by placing a pipe in the beater from any steam vessel.

Muriatic acid, beside the oxide of iron, dissolves the carbonate of lime, red rosin, and alumina, contained in the indigo, and by being mixed with water, the greater portion of the extractive matter would be taken up at the same time. By boiling the pulp in water strongly impregnated with muriatic acid, the indigo remaining would be twenty-five per cent. better than any hitherto made, and a price, more than equivalent to the difference in the loss of weight and expense of working, would be obtained from the consumer.

I have been informed by some South Carolina planters, that owing to their inability to proceed with the fermentative operation as rapidly as the crops require, a portion is often left on the fields for two or three weeks after the plants have arrived at maturity. This circumstance alone is sufficient to blast the interest of the planters. Their interest would be much better consulted, by gathering in the crop, drying it, and extracting the colouring matter by the simmering process. This difficulty is obviated in Bengal by their planting the seed in successive periods, so that one crop shall ripen, a week or more after the other, each crop being sufficient to supply one set of tanks during the period of maturity.

Dyers, as well as indigo planters, would be highly benefitted by attending to the analysis of indigo. Were they, when a superior colour is wanted, to boil the ground indigo in a bag, as described by Quatremere, there would be no difficulty of obtaining the desired result from indigo of any quality. [*Silliman's Journal.*

On the use of Anthracite in Blacksmiths' Shops. By G. Jones, Tutor in Yale College.

In a recent visit to Mauch Chunk and the vallies of Wyoming and Lackawana, I was struck with the universal employment of anthracite in the blacksmiths' shops of those regions, and with the strong terms in which the workmen expressed their preference for it over every other kind of coal. To use their own words, "they would not substitute charcoal, if it were brought and offered them for nothing, at their doors." Though familiar with it in the grates of parlours, and in furnaces, on our sea-board, the present was a use to which I had not hitherto seen it applied. I gave the subject some attention, and as the results may be useful to the public, will endeavour to offer them.

The kind of coal to be employed.

Every one familiar with anthracite, in place, knows that its varieties, even in the same bed, are very great. Some of the strata are usually slaty, portions of others are charged with sulphuret of iron, (iron pyrites,) while other parts, generally far the greater portion, are almost entirely carbonaceous. The last is always preferred by the smiths, and the value of pure coal to them is so well known, that

in one mine, near Wilkesbarre,* which we visited, a stratum was reserved for them, the coal from which was sold for two dollars per ton, while for the remainder but half this price was demanded. As the proprietors of the different mines, however, are desirous of acquiring a good reputation for their coal, only the best is now sent to the sea-board, and it is probable that but a small portion of the anthracite in our markets is unfit for the heating of iron. The proper coal is easily distinguished: I seated myself by a heap of anthracite, near a smith's shop, in Wilkesbarre, and with a little assistance from the owner learned, in five minutes, to discriminate between the different kinds. The slaty coal is inferior in lustre, and an experienced eye will easily distinguish the delicate lines of the slate: its fracture is also even, while that of the pure anthracite is more or less conchoidal. The sulphuret of iron forms usually fine white specks, and may be easily observed from its contrast with the glossy jet of the coal. If any difficulty, however, is found in making the distinction before heating, there can be none when the coal is in the furnace. The slaty coal soon becomes covered with a white ashy coat, and has a dull appearance: the pyritous coal has a bright glow, but on being moved, will send up numberless brilliant sparks; its smell is also stronger, but the smiths rely more on the former circumstance than on the smell. The slaty coal will not injure the iron; its only evil is in the inferior degree of heat it affords. The case is different with the pyritous anthracite. Yellow iron pyrites is a bi-sulphuret: when heated, one proportional of its sulphur combines with the bar to be forged, making it a proto-sulphuret, and giving consequently a brittle character, which renders it difficult to be wrought. When in small quantities, however, neither the slaty nor the pyritous coal is to be dreaded: if the latter is in larger proportion, the smiths find an easy security from its influence, by throwing common salt upon the fire. Only a small quantity is needed: they simply scatter it upon the ignited coal and then work confidently, as in other cases: I was informed that it is uniformly effectual. Salt is sometimes used by them to assist in igniting the anthracite: I have observed, since my return, that it is also used as a guard against sulphur in bituminous coal.

The manner of constructing the furnace.

The general construction need not differ from that in other shops, the bellows and the hearth being the same. The tuyere-iron, (pronounced by the smiths as if spelt *tue*-iron,) however, must have a greater diameter: in the shops which I have examined, it varied from three-fourths of an inch to an inch; about seven-eighths of an inch, for the inside diameter, was usually considered the best. As there are no sparks or smoke, a chimney is not needed; and although one might be of service in carrying off the gases which arise from the coal, the shops at Wilkesbarre are usually constructed without any chimney, an opening in the gable end near the roof being found to

* The Baltimore mine.

answer the purpose nearly as well: even this is used only during the summer. In visiting these shops, a person is struck with the cleanly appearance of the workmen, the dust from anthracite, though penetrating, not being of a character to soil either furniture or clothes: I frequently heard the workmen speak boastingly of the fact that they could now be as clean and comfortable as persons engaged in any other trade.

The manner of using the coal.

Charcoal or dry wood is requisite for igniting the anthracite; when fairly ignited, it will need no foreign help, provided the iron to be heated is small, and is to be operated upon to no great extent at one time. If the bar is large and requires a diffused heat, a small quantity of charcoal must be mingled with the anthracite, as without this, the bellows are not able to ignite a large quantity of the mineral coal. The iron to be heated should not be thrust down so near the tuyere-iron as is the case when charcoal is employed. Most of the failures, at the first use of anthracite, I was informed, arise from ignorance of this circumstance, from having the diameter of the tuyere-iron too small, and from leaving the iron too long upon the fire. Anthracite will heat a bar in one half the time that is requisite for charcoal, and until the blacksmith is familiar with its use, the heating process must be closely observed, or the iron will be burnt, before he thinks that it has been sufficiently heated. The bar may easily be watched, as from its being so far above the tuyere-iron, the quantity of coal above it is smaller than in the charcoal furnace, and it may be kept constantly in sight. While in the fire, it should be suffered to remain undisturbed; if moved about, as is common in the charcoal fire, the heating will be retarded.

Advantages of the anthracite coal.

Some of these may be inferred from the preceding remarks. They consist chiefly in the saving of time and of money. From the rapidity with which the iron is heated, the quantity of work done is about one-third greater than when charcoal is employed. The gain, as respects the cost of materials, will depend on the price of anthracite, which from its weight, increases rapidly in value as we recede from the mines. The Carbondale Company state that they will be able to offer it in the New York market, the coming season, for $6 50 per ton; and the time will soon arrive, when from the increased facilities for transportation from the various coal regions and from the rivalry of the different companies, this fuel may be had at a price far less. At its present cost, however, even at remote places, it is much cheaper than charcoal. A ton of anthracite will heat as much iron as two hundred bushels of the latter, which at the average price of seven or eight dollars per hundred bushels, will give a saving of about one half in favour of the anthracite. I visited a shop sixty-five miles from Mauch Chunk, from which mine the owner was in the habit of bringing his coal in wagons: he said it cost him ten

dollars per ton, delivered at his door, but that even at this price it produced a saving of 80 per cent. in his material, and he seldom employed any other coal. The use of it has extended to a considerable distance, in all directions from the coal region, and is now increasing rapidly in Philadelphia: in a few years, it will probably be general throughout the country. The first effort at employing it, will generally be attended by difficulties: sometimes the smith fails entirely, and throws it by in disgust; but I believe I have not heard of one case, in which a fair trial has been made, that has not resulted in a great fondness for this species of coal. Still, however, its best friends acknowledge that for some purposes it is not well adapted. When a *hollow heat* is requisite, it will not answer; nor will it suit in forges where the fire must be greatly disturbed by the removal and replacement of the bar. It is said also not to be good for *tempering*, but I have seen it employed for this, and in Mons. Brard's *Minéralqgie appliquée aux arts*, I observe it is spoken of as highly useful in the manufacture of a variety of delicate edge tools.

[*Ib.*

Report on Fulminating Powders capable of being used as priming for Fire-arms. By Messrs. Aubert, Pelissier, *and* Gay-Lussac.

[From Annales de Chimie, xlii. September 5, 1829.]

[Concluded from page 133.]

The strength of fulminate of mercury is much greater than that of the best gunpowder, but it would be difficult to say how much.* To estimate it, various quantities of fulminate of mercury and gunpowder have been exploded under a hollow mass of copper, placed so that its ascent might be measured. It has been found, in this circumstance, that the fulminate raised the mass of copper to a height from fifteen to twenty times greater than the powder.

The great rapidity of the explosion of mercurial fulminating powder, from which effects result similar to those produced by a missile thrown from a fire-arm, might render its employment useful in some circumstances, for instance, for breaking gates under the form of petards.

Mixture of fulminate of mercury with powder for making priming.

The quantity of fulminate of mercury necessary for a priming (*une amorce*) is so small, that it is in a manner unmanageable. One has been naturally led to mix it with common powder, to increase the bulk of the priming; but this is not the chief advantage of the mixture. Indeed, pure fulminate of mercury communicates inflamma-

* The French marine has adopted a priming made with the same powder, which is placed on the touch-hole of the cannon, and which not only carries the fire to the charge, through the whole thickness of the metal, but also cracks the cartridge, however strong may be the parchment or material of which it is made.

tion to powder but with difficulty, and at much smaller distances than when it is mixed with bruised or very fine powder: this is a consequence of the instantaneousness of its inflammation. If it is alone, the elastic fluids have lost the greater part of the caloric before reaching the powder, and can no longer inflame it; but, if it is mixed with very fine powder, the latter is carried to the powder while in a state of ignition, and sets fire to it.

In the trials of mixtures of the fulminate with various substances, made rather with a view to preserve the priming from humidity than to change the composition of the powder, it was found that many were unfavourable to the explosion of the fulminate, although mixed with it only in very small proportions; such are oil, tallow, and rosin.

The most advantageous proportions for caps is ten parts by weight, of fulminate, and six parts of bruised powder. They are rendered a little less quick with ten of fulminate and seven of fine powder.

In waxed primings, the bruised powder should be in less proportion. It amounts to five parts in those of commerce, and is 3.3 in the priming proposed by M. Vergnaud for muskets.

The quantity of fulminate of mercury sufficient for a fowling piece is 0.0166 grammes $= \frac{1}{4}$ gr. Eng. or 57600 primings may be made with one kilogramme (= 2.2 lbs. avoirdupois) of the fulminate; but, for muskets, the priming should be a little augmented. In the waxed primings the quantity of fulminate is 3 centigrammes (= 0.46 grain E.) or nearly double that of the priming caps.

The force necessary for producing inflammation of the fulminate of mercury increases as the proportion of bruised powder becomes greater, and the layer of the fulminate thicker. Consequently primings may be made more or less explosive, which should inflame, for example, by the blow of the hammer falling from the whole cock, and not when falling from the half cock. A ram falling from different heights has been used with advantage for measuring this force; but the necessity has been discovered of seeking at the same time the extent of the propagation of the inflamed jet in the passage leading to the powder; for, as it has been remarked, it is not the pure fulminate which carries inflammation the furthest. Besides, the most explosive primings may be employed, without fear of inflaming them by the fall of the hammer from the half cock, on leaving between it and the passage, or touch-hole, but a very small distance.

Examination of fulminating primings with regard to foulness, and to their action upon iron.

Fulminating mercury, as already remarked, leaves a carbonaceous residue on the bodies on which it has been detonised. This residue is very considerable relatively to the weight of the fulminate; but it is followed by no inconvenience by reason of the extreme smallness of the fulminating primings. Besides, it never acquires coherency, and cannot accumulate much without being dispersed by the effect of the detonation. It exerts moreover no corrosive action on iron.

Fulminating primings, such as are used, and which are a mixture of fulminating mercury and bruised gunpowder, act in a different

manner. If the foulness which they leave be judged of by the number of times of missing fire, a very accurate way of appreciating the inconveniences, we should regard it as null; for, by experiments which will be stated hereafter, in a hundred successive shots, there was not one instance of a miss fire, neither in the touch hole nor the barrel, whilst with common powder and our old locks the times of missing fire are commonly reckoned as one in seven shots.

To appreciate the corrosive action of the fulminating priming, nearly equal quantities of pure fulminate of mercury mixed with bruised powder for priming, and of chlorate of potash mixed with common powder, were detonised in a well polished gun barrel. A portion of the barrel was also moistened with a solution of marine salt, and the barrel was laid in a damp place on the ground floor. Twenty-four hours afterward, the effect produced on the iron was examined. The pure fulminate had left a carbonaceous residue which appeared more bulky than that of common powder, but underneath it the iron was unaltered. Common powder gave less residue, and had less rusted the iron than the fulminating powder for priming: after this it was the salt water, and, lastly, the chlorate powder, which produced the most rust.

Examination of the advantages of percussion guns, with respect to the economy of powder.

In the common gun, there is a loss of elastic fluids by the touch-hole, which does not occur with percussion guns, and it has appeared interesting to measure the extent of this loss.

Two similar guns were taken of the pattern of 1816, for the infantry, which we shall designate as No. 1 and No. 2, and they were tried in succession by the pendulum, with a charge of 10 grammes (= 154.34 grains, E.) of musket powder and a ball of 19 to the pound, placed between two smooth pieces of card as wadding. The recoil being found to be the same for both guns, a percussion lock was fitted to No. 2, and the quantity of powder which was required as a charge was sought for to obtain the same recoil as with the other gun loaded with 10 grammes of powder and a ball. It was found that 9.14 gr. (= 141.1 grains) were sufficient, and, consequently, the charge might be diminished nearly one-tenth, by substituting the percussion for the common gun, without lessening the distance to which it would carry. The ratio just stated, remains exactly the same, on employing charges a little exceeding 10 grammes, and applies exactly to the charge of 12.25 gram. (= 189.1 grains) of military fusils, whereof about 11 grammes only enter the barrel.*

To the economy of powder of about one-tenth of the charge produced by the adoption of the percussion gun, must be added that of the priming in the common gun, the weight of which when the pan is filled, is, at a mean, about 1.1 gramme (= 17 grains nearly,) and last that due to missing fire, or flash in the pan only, commonly

* The difference between the effects of percussion guns and those with flints, is perhaps also due in part to the greater rapidity of the inflammation of the charge occasioned by the priming of fulminating powder.

estimated at one in seven shots. By uniting these different quantities, we find 2.276 (= 35 grains) of saving for every shot of 12.25 grammes (= 189 grains,) or 2.276 kilogrammes (= 5 lbs. avoird.) in 1000 shots, or lastly, 6.26 francs, at 2.75 francs per kilogramme of powder. Indeed, this advantage is partly compensated by the price of the fulminating priming, which may be estimated, for caps, at 3.50 francs the thousand; but, on subtracting this last number from 6.26 francs, we still obtain a saving of 2.76 francs in 1000 discharges. Furthermore we insist on this calculation only to show that the adoption of fulminating primings would be, with regard to economy, more advantageous than onerous.

Missing fire in percussion guns.

In order the better to appreciate the effect of fulminating primings, we have endeavoured to place ourselves in circumstances similar to those which occur in war, by employing for the experiments, a musket powder a little altered, and badly dusted (epoussétée.) The gun was fired with ball, with the accustomed charge, and with fulminating caps.

With a chimney of which the diameter was 1.1 millimetre (= 0.04 inch,) the barrel began to miss fire at the 53d shot, and from the 53d to the 60th, six primings were used without clearing the touch-hole before it went off.

By substituting a chimney of 1.85 millimetre (= 0.073 inch) in place of the former, there was no miss fire in 100 shots, in several series of experiments. After the last series, the gun was not cleaned, and the next morning the shooting was recommenced. Missing fire occurred at the following shots: 1, 2, 3, 4, 5, 6, 7, 16, 42; but afterwards the series of shots up to 100, was terminated without missing fire. It was evidently the foulness of the chimney formed the preceding evening, expanded by the damp which it had absorbed, which occasioned the missing fire. It is remarkable that, in all these experiments, the primings did not once fail to explode.

The same trials were recommenced with the waxed primings proposed by M. Vergnaud, using the same gun, its lock having been suitably modified. The temperature of the atmosphere being very high, led to the discovery of several inconveniences of the waxed primings; they became soft, stuck together by a slight pressure, and lost their form. While the temperature was high, the number of times of missing fire, with the chimney of 1.1 millimetre, was greater than with caps: the failures often began with the 20th shot, but did not become continuous, as with caps, till towards the 60th. With a touch-hole 1.85 *m.* (= 0.073 inch) in diameter, there was not one failure in 100 shots; but the foulness then became so considerable it was necessary to use a shade for the sight (couvre-vue.) The priming sometimes failed to explode, which might depend as much on its peculiar nature as on the form of the gun lock.

This is not the place for comparing the lock for waxed primings to that for caps: we shall confine ourselves to remarking, that the lock for caps requires less precision in its execution than the other;

that its hammer will more certainly strike the chimney in a perpendicular direction, and will require less force for inflaming the priming; and, lastly, the foulness will be considerably less.

The advantage of having no miss fire is not confined to an economy of powder of one priming in seven: it must be considered that the quantity of powder employed by the soldier, whether involuntarily, or designedly, as he often does to diminish the recoil of his piece, is much more considerable than that which has been supposed. But, independently of that saving which may appear insignificant, the absence of every failure to discharge the piece has the immeasurable advantage of augmenting the assurance of the soldier, by giving him the certainty that his piece will not fail him in face of the enemy at the moment of danger.

It might be thought that we could not succeed in preventing the missing fire but by giving the chimney of the touch-hole too great a diameter, and consequently by diminishing the distance to which the piece would carry; but experiment has taught us, that the recoil of the pendulum fusil is exactly the same with a chimney 1.85 mill. in diameter, as with a chimney 1.10 mill. in diameter. This result will not surprise, if it be considered that the chimney remains closed up by the hammer after the percussion. It would be even possible to enlarge the diameter still more, on giving the hammer a force sufficient to resist the effort of the elastic fluids which tend to escape through the touch-hole.

Further, we have convinced ourselves that, even in a common gun, the variation of the diameter of the touch-hole, within the limits from one to two millimetres, occasions no perceptible diminution of the distance to which it will carry. The following is a table of the results which we have obtained.

Diameter of the touch-hole.	Charge of powder corresponding to each diameter for obtaining the same recoil by the pendulum fusil.
0.90 millim. = 0.035 in.	10.00 grammes = 154.34 grs. Eng.
1.66 .... = 0.065	10.00 .... = 154.34
2.76 .... = 0.108	10.39 .... = 160.36
3.48 .... = 0.137	10.72 .... = 165.45

Manufacture of the fulminate of mercury.

This powder is prepared with mercury, nitric acid at 38° or 40° of Baumé, (= 1.36 to 1.36 s. g.) and alcohol at 85 or 88 centesimal degrees. Varied experiments on small quantities have taught us that the best proportions are those found by Howard: 1 mercury, 12 nitric acid, and 11 alcohol. One kilogramme of mercury (= 2.2 lbs. avoird.) produces $1\frac{1}{4}$ kilogramme of pure fulminate, a quantity with which at least 40,000 primings in caps may be made for the military fusil.

The fulminate of mercury, as it is prepared, being in small crystals, are to be first ground on a marble table with a wooden mullar

after having wetted it with 30 per cent. of water. Afterward, add six parts of common powder to ten parts of fulminate, and continue the grinding. A firm paste is obtained, which dried to the proper degree by exposure to the air, is made into grains, each of which is to form one priming.

If the fulminate of mercury offers no danger as long as it is moist, it is no longer the case when it is dry, and should not then be handled without great caution. Nevertheless we may avoid employing it in that state; and as the manufacture of fulminating priming will be always very small, and as it may be very much divided, and very perfect methods of proceeding applied to it, we do not hesitate to declare that it might be made without any difficulty and without more danger than that of common powder in the government establishments. An explosion would have even less injurious consequences, as well to the workmen as the buildings, on account of the very small quantity of matter under manipulation.

Different sorts of priming hitherto employed.

There have been used, 1st, the fulminating powder in grains; 2nd, the powder in pastilles covered with lead or paper; 3d, the powder in grains varnished; 4th, the waxed primings; 5th, the caps or capsules; and 6th, tube primings.

The powder in grains is very dangerous, for the explosion of a single grain produces that of the whole mass. It is almost entirely disused. The other primings have not the same inconvenience; but as they have it in common to have a covering, and as those called waxed, and with caps, are almost the only ones in use, we shall occupy ourselves with the latter only.

The waxed primings were in use with sportsmen, when proposed by M. Vergnaud for the infantry. Every one contains three centigrammes (nearly half a grain Eng.) of fulminate of mercury, and one centigramme of bruised gun powder, and are enveloped with a coating of wax applied by hand, which defends them very well from the action of moisture, and prevents them from exploding simultaneously. They fix also very readily to the pan, and may be easily carried, and without danger, by always taking care to protect them from the heat of the sun, and that of other bodies which might produce their agglomeration.

They have the inconvenience of causing great foulness, and giving a little more smoke and smell than cap primings. Their present price in commerce is from 6.75 to 7 francs per thousand.

The cap primings are most in use at present, and form at least 99 per cent. of the consumption: those for the guns of sportsmen contain in each priming 0.017 grammes of fulminate of mercury, mixed with six-tenths of its weight of bruised gunpowder (*pulverin.*) These primings very well resist the action of humidity, and take fire after several hours immersion in water. Their very regular and solid form allows of their being fixed on the chimney of the touch-hole by mechanical means, which will be very advantageous for military fusils. In the explosion, the copper cap is torn, and rarely

divided and projected; but, by hollowing the head of the percussion hammer, the copper is no longer projected excepting towards the ground.

The copper caps are made by means of a fly press with great rapidity. The primings sometimes take fire during their manufacture; but the inflammation but very rarely communicates to the small number of those under manipulation. They are easily carried and without danger. Their present price in commerce is 3½ francs per thousand. At this moment, we cannot say which sort of priming, the waxed or the cap priming, would be preferable for military service. Experiments will be necessary to resolve the question.

Conclusion.

The experience acquired respecting fulminating primings, and their almost general use for the guns of sportsmen, render their advantage in war incontestable. Their adoption would save powder, render the discharge certain, and give the soldier more confidence.

The chlorate of potash powder having the inconvenience of rusting and making the arms very foul, and of occasioning in consequence the piece to miss fire, the primings with fulminate of mercury should be preferred, having none of those inconveniences.

The manufacture of fulminate of mercury, although not without danger, offers no real difficulties, and the administration of powders would speedily be prepared to undertake it, and to supply all the wants of government.

The primings proposed by M. Vergnaud, are composed of fulminate of mercury, like those already in use; but they are characterized by their covering of wax. Those in caps, judging from the almost general use of them for fowling pieces, appear to be preferable, but the wants of the military service may require other conditions which it does not belong to us to examine, and experience alone should determine the preference.

In terminating this report, we think it right to anticipate an objection which might be raised against the application of fulminating primings to fire-arms used in war, namely, that the mercury forming the essential basis of these powders comes to us from foreign countries, and in case of war, we might be deprived of it, so as seriously to compromit the military service.

But to reduce this objection to its just value, it is sufficient to remark, that at least 40,000 primings can be made with one kilogramme of mercury, and that with 100 kilogrammes four millions of primings might be made, a sufficient quantity for 100,000 men. It would therefore be easy to provide at a favourable time a sufficiency of mercury for the military service; besides, we know by experience, that even during the last continental blockade, France was never in want of mercury. Lastly, we might, in case of need, substitute for a short time the chlorate of potash for fulminate of mercury, without making any change in the locks of the fire-arms, or might employ even fulminate of silver.

Observations on Writing Ink. By J. Bostock, M. D., F. R. S.

[From the Transactions of the Society of Arts.]

When the sulphate of iron and the infusion of galls are added together, for the purpose of forming ink, we may presume that the metallic salt or oxide enters into combination with at least four proximate vegetable principles:—gallic acid, tan, mucilage, and extractive matter; all of which appear to enter into the composition of the soluble part of the gall nut. It has been generally supposed, that two of these, the gallic acid and the tan, are more especially necessary to the constitution of ink; and hence it is considered, by our best systematic writers, to be essentially a tanno-galate of iron. It has also been supposed, that the peroxide of iron alone possesses the property of forming the black compound which constitutes ink, and that the substance of ink is rather mechanically suspended in the fluid than dissolved in it.

Ink, as it is usually prepared, is disposed to undergo certain changes, which considerably impair its value; of these the three following are the most important: its tendency to moulding; the liability of the black matter to separate from the fluid, the ink then becoming what is termed ropy; and its loss of colour, the black first changing to brown, and at length almost entirely disappearing.

Besides these, there are objects of minor importance to be attended to in the formation of ink. Its consistence should be such as to enable it to flow easily from the pen, without, on the one hand, its being so liquid as to blur the paper, or, on the other, so adhesive as to clog the pen, and to be long in drying. The shade of colour is not to be disregarded; a black, approaching to blue, is more agreeable to the eye than a browner ink; and a degree of lustre or glossiness, if compatible with the due consistence of the fluid, tends to render the characters more legible and beautiful.

With respect to the chemical constitution of ink, I may remark, that although, as usually prepared, it is a combination of the metallic salt or oxide with all the four vegetable principles mentioned above, yet I am induced to believe, that the last three of them, so far from being essential, are the principal cause of the difficulty which we meet with in the formation of a perfect and durable ink. I endeavoured to prove this point by a series of experiments, of which the following is a brief abstract: having prepared a cold infusion of galls, I allowed a portion of it to remain exposed to the atmosphere, in a shallow capsule, until it was covered with a thick stratum of mould; the mould was removed by filtration, and the proper proportion of sulphate of iron being added to the clear fluid, a compound was formed of a deep black colour, which showed no farther tendency to mould, and which remained for a long time without experiencing any further alteration.

Another portion of the same infusion of galls had a solution of isinglass added to it, until it no longer produced a precipitate; by

employing the sulphate of iron, a black compound was produced, which, although paler than that formed from the entire fluid, appeared to be a perfect and durable ink. Lastly, a portion of the infusion of galls was kept for some time at the boiling temperature, by which means a part of its contents became insoluble; this was removed by filtration, when, by the addition of the sulphate of iron, a very perfect and durable ink was produced. In the above three processes, I conceive that a considerable part of the mucilage, the tan, and the extract. were respectively removed from the infusion, while the greatest part of the gallic acid would be left in solution.

The three causes of deterioration in ink, the moulding, the precipitation of the black matter, and the loss of colour, as they are distinct operations, so we may presume that they depend on the operation of different proximate principles. It is probable that the moulding more particularly depends on the mucilage, and the precipitation on the extract, from the property which extractive matter possesses of forming insoluble compounds with metallic oxides. As to the operation of the tan, from its affinity for metallic salts, we may conjecture, that, in the first instance, it forms a triple compound with the gallic acid and the iron, and that, in consequence of the decomposition of the tan, this compound is afterwards destroyed. Owing to the difficulty, if not impossibility, of entirely depriving the infusion of galls of any one of its ingredients, without, in some degree, affecting the others, I was not able to obtain any results which can be regarded as decisive; but the general result of my experiments favours the above opinion, and leads me to conclude, that, in proportion as ink consists merely of the gallate of iron, it is less liable to decomposition, or to experience any kind of change.

The experiments to which I have alluded above, consisted in forming a standard infusion, by macerating the powder of galls in five times its weight of water, and comparing this with other infusions which had either been suffered to mould, from which the tan had been abstracted by jelly, or which had been kept for some time at the boiling temperature, and by adding to each of these respectively both the recent solution of the sulphate of iron, and a solution which had been exposed for some time to the atmosphere. The nature of the black compound produced was examined by putting portions of it into cylindrical jars, and observing the changes which they experienced, with respect either to the formation of mould, the deposition of their contents, or any change of colour. The fluids were also compared by dropping portions of them upon white tissue-paper, in which way both their colour and their consistence might be minutely ascertained. A third method was, to add together the respective infusions and the solutions of the sulphate of iron in a very diluted state, by which I was enabled to form a more correct comparison of the quantity and of the shade of the colouring matter, and of the degree of its solubility.

The practical conclusions that I think myself warranted in drawing from these experiments are as follow:—in order to procure an ink which may be little disposed either to mould or to deposit its

contents, and which, at the same time, may possess a deep black colour not liable to fade, the galls should be macerated for some hours in hot water, and the fluid filtered; it should then be exposed for about fourteen days to a warm atmosphere, when any mould which may have been produced must be removed. A solution of sulphate of iron is to be employed which has been exposed for some time to the atmosphere, and which consequently contains a certain quantity of the red oxide of iron diffused through it. I should recommend the infusion of galls to be made of considerably greater strength than is generally directed, and I believe that an ink formed in this manner will not necessarily require the addition of mucilaginous substance to render it of a proper consistence.

I have only to add further, that one of the best substances for diluting ink, if it be, in the first instance, too thick for use, or afterwards become so by evaporation, is a strong decoction of coffee, which appears in no respect to promote the decomposition of the ink, while it improves its colour, and gives it an additional lustre.

Method of Condensing Brass. By Mr. CORNELIUS VARLEY.

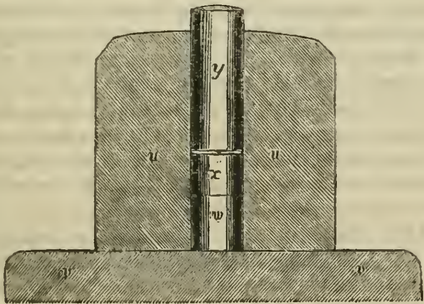
[From the Transactions of the Society of Arts.]

SIR,—About thirty-five years ago, a very costly chronometer was put into the hands of my late uncle, Mr. Samuel Varley. It was apparently without fault, but had baffled the efforts of some of the best workmen in the trade to make it keep time. My uncle discovered the cause of this imperfection to arise from the balance being magnetic; he accordingly replaced it with one of well hammered gold, and the watch was soon made to keep good time. He was ever afterwards accustomed to employ gold or brass as the material for the balance of all important watches, making the brass himself in order to secure its purity, and hammering both it and the gold in the tool about to be described. He also made escapement wheels of brass thus hammered, and was frequently applied to by others in the trade for brass of his making and preparing, it being found that such would bear cutting finer and sharper than any other, without failing; for (to use the somewhat quaint but expressive phrase of the workmen,) his brass exhibited in the lathe a certain sweetness and pleasantness, evidently the result of superior homogenity.

If a piece of malleable metal be successively struck on two opposite sides by a hammer, the face of which is larger than the metal, this latter soon spreads out and cracks at the edge. If, on the contrary, the face of the metal is larger than that of the hammer, and the blows be given as nearly as may be, on the centre of the plate, the part struck, being surrounded by a hoop of metal, as it were, can scarcely spread laterally, and is soon hardened by condensation: but the neighbouring parts, in proportion as they approach the margin of the plate, not being sufficiently restrained from spreading under the hammer, cannot be hardened in the same degree with the middle portion: besides, every blow, while hardening the part im-

mediately under it, is, in consequence of the inequality of resistance, producing a contrary action on the adjacent parts, by violently straining and stretching them. If the metal be in the form of a block, and be hammered on all sides, a tolerably uniform mass may be obtained; but this uniformity is only a balance of opposite states all through the mass, it being impossible to condense the block by hammering in one part, without forcibly straining the neighbouring parts. Such hammering, therefore, is limited; for although a certain quantity hardens the metal, every blow beyond this increases its unsoundness, till at last the block is good for nothing, and can only be cured by melting or welding it afresh.

The tool (shown in the annexed cut,) obviates all these inconveniences. *u*, *u*, is the section of a block of hard steel, made perfectly flat at bottom, where it rests on the face of the anvil, *v*, *v*; a hole, about one-fourth of the diameter of the block, is bored through its axis truly vertical; *w* is a short cylinder of hard steel dropped into the hole in the block, which accurately fits, and resting on the anvil; *x* is the piece of brass or other metal to be hardened: it must be turned quite clean and smooth, so as to fit the hole with perfect accuracy, and must be made quite flat both at bottom and at top; *y* is a punch of hard steel, with a somewhat convex top. The pieces being put together, the top of the punch *y* is to be struck with a moderately heavy hammer, gently at first, and increasing gradually to the utmost effect; this must then be changed for the largest hammer that the block and punches can safely bear. The momentum of the blows will be communicated to the disk *x*; and as both this and the punches are made accurately to fit the hole in the block, it is evident that the only effect of the blows can be the condensation of the disk *x*.



At the commencement of the hammering, a remarkable difference, both in the sound and in the feel of the hammer in the hand, will be perceived between striking on the punch and on the anvil: as the work proceeds, this difference becomes less; and when the difference has ceased, that is, when the hammer rebounds from the top of the punch as much as it would do from the anvil, the metal has acquired its greatest degree of hardening by compression. A large

hammer, with moderate speed, appears to communicate its effect deeper into a block of metal than a lighter one moving as much quicker as it is lighter; for the metal springs to a quick blow, for want of time to allow the particles permanently to recede; a heavy blow, on the contrary, being slower than the vibrations of the metal, overrules them, and sends the effect deeper into its substance. The shorter the punch, the more efficiently does it communicate the impulse of the hammer: the length, therefore, of the hole in the block above the metal should not be more than sufficient to form a secure guide to the punch, and the upper unsupported part of the punch should be as short as it can conveniently be made. The block, as well as the upper and the lower punch, should be hardened and then tempered to a straw colour, to enable them to bear the long continued action of the hammer.

The disk of the metal is got out by withdrawing the upper punch, and then placing the block over a hole larger than its own; a long punch being then put in, a few blows of the hammer will force out the short punch and the condensed metal.

Account of the CHEVALIER ALDINI'S *Apparatus for the preservation of persons exposed to flames.*

THE Chevalier Aldini, of Bologna, has been earnestly occupied in the construction of an apparatus, or rather clothing, intended to preserve persons from injury who are exposed to flames, which has become the subject of some of the *Conversazioni* at the Royal Institution. The following description of its composition and effects, in the words of Professor Farraday, will convey a just idea of its properties as well as of its application:—

A union of the powers possessed by a metallic tissue to intercept flame, with the incombustible and badly conducting properties of amianthus, or other substances, has been made in the apparatus; and the latter consists of two distinct systems of clothing, the one near the body composed of the badly conducting incombustible matter, and the other, or external envelope, of a metallic tissue.

The pieces of clothing for the body, arms, and legs, are made of strong cloth which has been soaked in a solution of alum; those for the head, the hands, and the feet, of cloth of asbestos. That for the head is a large cap, which entirely covers the whole of the neck, and has apertures in it for the eyes, nose, and mouth, these being guarded by a very fine copper wire gauze. The stockings and cap are single, but the gloves are double, for the purpose of giving power of handling inflamed or incandescent bodies.

M. Aldini has, by perseverance, been able to spin and weave asbestos without previously mixing it with other fibrous substances; the action of steam is essential in the bending and twisting of it, otherwise the fibres break. The cloths prepared with it were not of close texture, but loose: the threads were about one-fiftieth of an inch in diameter, and of considerable strength: cords of any size or

strength may be prepared from them. M. Aldini hopes to be able so to prepare other fibrous matters, as to be able to dispense altogether with this rare and costly material.

The metallic defence consists of five principal pieces; a casque, or cap complete, with a mask: this is of such size as to allow of sufficient space between it and the asbestos cap, and is guarded before the face by a visor, so that the protection is doubled in that part; a cuirass, with its brassets; a piece of armour for the waist and thighs; a pair of boots of double wire gauze; and an oval shield, five feet long, and two and a half wide, formed by extending gauze over a thin frame of iron. The metallic gauze is of iron, and the intervals between the threads about one twenty-fifth of an inch each.

When at Geneva, M. Aldini instructed the firemen in the defensive power of his arrangements, and then practised them before he made the public experiments. He showed them that a finger enveloped first in asbestos, and then in a double case of wire gauze, might be held in the flame of a spirit lamp or candle for a long time, before inconvenient heat was felt; and then clothing them, gradually accustomed them to the fiercest flames.

The following are some of the public trials made. A fireman having his hand inclosed in a double asbestos glove, and guarded in the palm by a piece of asbestos cloth, laid hold of a large piece of red hot iron, carried it slowly to the distance of 150 feet, then set straw on fire by it, and immediately brought it back to the furnace. The hand was not at all injured in the experiment.

The second experiment related to the defence of the head, the eyes, and the lungs. The firemen put on only the asbestos and wire gauze cap, and the cuirass, and held the shield before his breast. A fire of shavings was then lighted, and sustained in a very large raised chafing-dish, and the fireman approaching it, plunged his head into the middle of the flames, with his face towards the fuel, and in that way went several times round the chafing-dish, and for a period above a minute in duration. The experiment was made several times, and those who made it said they suffered no oppression or inconvenience in the act of respiration.

The third experiment was with the complete apparatus. Two rows of faggots, mingled with straw, were arranged vertically against bars of iron, so as to form a passage between thirty feet long, and six feet wide. Four such arrangements were made, differing in the proportion of wood and straw, and one was with straw alone. Fire was then applied to one of these double piles, and a fireman, invested in the defensive clothing, and guarded by the shield, entered between the double edge of flames, and traversed the alley several times. The flames rose ten feet in height, and joined over his head. Each passage was made slowly, and occupied from twelve to fifteen seconds; they were repeated six or eight times, and even oftener, in succession, and the firemen were exposed to the almost constant action of the flames for the period of a minute and a half, or two minutes, and even more.

When the course was made between the double range of faggots without straw, the fireman carried a kind of pannier on his back,

prepared in such a way as to be fire proof, in which was placed a child, with its head covered by an asbestos bonnet, and additionally protected by the wire gauze shield.

Four firemen made these experiments, and they agreed in saying, that they felt no difficulty in respiring. A very abundant perspiration came on in consequence of the high temperance to which they had been exposed, but no lesion of the skin took place except in one instance, where the man had neglected to secure his neck by fastening the asbestos mask to the body dress.

No one present could resist the striking evidence of defence afforded when they saw the armed man traversing the undulating flames, frequently hidden altogether from view by them as they gathered around him.

The fact that in M. Aldini's apparatus a man may respire in the middle of the flames is very remarkable. It has often been proved, by anatomical examination, that in cases of fire many persons have died altogether from lesions of the organs of respiration. It would appear that the triple metallic tissue takes so much of the caloric from the air as it passes to the lungs, as to render its temperature supportable; and it is known, by experiments in furnaces, that a man can respire air at 120 or 130° C. (= 246 or 267° F.) and even higher. Perhaps also the lesions referred to may have been due to aqueous vapour, which is often produced in great abundance in fires where endeavours are made to extinguish them by water, for such vapour would transfer far more heat to the lungs than mere air. Hence in every case, and however guarded, firemen should enter houses in flames with great prudence, because the circumstances are not the same as in the experiments just described.

It is remarked that several suits of this defensive clothing should be provided, not to clothe many persons at once, but that, in endeavouring to save persons or valuable things in cases of fire, the fireman should not approach again and again in heated clothing, but have a change at hand. The grand duke of Tuscany has ordered six suits for the city of Florence.

M. Aldini showed several experiments relative to the extinguishing power of his preparations before the Société de Physique de Genève. One consisted in placing an asbestos cloth of loose texture over a flame either of wax or alcohol; the flame was intercepted as well as it could have been by a piece of wire gauze. This experiment is supposed to favour the objections made to sir H. Davy's explication of the theory of the wire gauze safety lamp; but there seems to be a mistake in the idea which has been taken of that theory. Sir H. Davy never explained the effect of his lamp by absorption of heat from flame dependant upon the good conducting power of the tissue alone, but by the joint action of absorption and radiation. There is no doubt that cloth of asbestos is an admirable radiator. and that this power, with its conduction, is probably sufficient to explain the effects upon sir H. Davy's theory.*

[*Rep. Pat. Inven.*

* It has been reported in some of the public journals, that it is in contemplation to supply the new police of the metropolis with this fire proof clothing.

Partial opening of the Liverpool and Manchester Rail-way.

[From the Manchester Mercury.]

In consequence of its having been announced, for a week or two in the newspapers, that the directors of the Liverpool and Manchester Rail-way intended, on Monday last, to proceed in a carriage, propelled by a locomotive engine, from Liverpool along the whole length of the line, to hold their first Board in Manchester, a great concourse of people assembled. At five minutes past eleven the directors and some of their friends, with the resident engineers, in all about forty, arrived in two carriages. The engine used on the occasion was a new one, constructed by Messrs. Stephenson, and designated the Arrow. In addition to its own weight, with its appendages for the supply of water, &c. 7 tons, it drew behind it seven wagons, laden with stones, weighing 27 tons, behind these were stationed two coaches, containing the directors and their friends, weighing 5 tons more; making a total weight of 39 tons. With this weight the engine compassed the distance (rather more than thirty miles) *in two hours and one minute*, exclusive of 19 minutes taken up in stoppages for the necessary supply of fuel and water.

[From the Liverpool Mercury.]

The directors (on their return to Liverpool) filled with their friends two coaches, which darted through the dense mass of individuals who thronged the rail-way, passed over Chat Moss at the rate of about 22 miles an hour, and arrived at Edgehill, Liverpool, (after deducting seven minutes for stoppages) *in one hour and thirty minutes.* The average speed on the return from Manchester was 20 miles an hour, and in passing over Chat Moss, the carriages proceeded, for a time, at the rate of 27 miles!

[From the Liverpool Times.]

The steam carriages vary in their size and plan; some have two bodies and others three; some are intended to accommodate four persons in each body, and others six; and some have a central compartment, which will contain six persons, with seats before and behind, and two other compartments are in front, and one in the rear, each of them resembling a post chaise, with windows in front, and containing only three persons. The seats, which accommodate three persons each, are, at least, twice as wide as a four inside stage coach, so as to allow the same space for three as is now allotted to four. Between the sittings is a rest for the arms, and each passenger has a cushion to himself: there is also a little projection against which he may rest his head; and the backs are padded and covered with fine cloth, like a private carriage, so that the passenger may sit and sleep with as much comfort and luxury as if he were in an easy chair or on a sofa. The external appearance of the coaches is nearly equal to that of a handsome carriage. There are no outside passengers on these vehicles, and they carry no luggage; but for the ac-

commodation of both, there is a different kind of carriage, about as high as a common cart, and having four or six rows of seats, under which there are receptacles for the luggage. The passengers by these conveyances will be not nearly so elevated nor so much exposed to the danger of falling off as the outside passengers on a stage coach. It is probable that one or more of the latter vehicles will always accompany the coaches. There are also light wagons prepared for the conveyance of bales of cotton—an article of which the quantity transported will be immense.

Cements for Iron Water Pipes.

M. Gueymard, in an interesting statement of the introduction of water into the city of Grenoble, says that the mastic which he has employed to connect the pipes, has been known for some years, by the name of *Aquin.* Most of the recipes vary, and those which he had obtained directly from Vienna, Lyons, Paris, and by correspondence from London, do not answer his purpose. For this reason he commenced a series of experiments, and found the following composition, acquired the hardness and compactness of good cast iron.

I mingle ninety-eight parts of cast iron filings (pounded turnings) passed through a coarse sieve, and not oxidized, with one part of flowers of sulphur. When intimately mixed, I take one part of sal-ammoniac, and dissolve it in boiling water; and pour this solution on the preceding mixture and agitate it thoroughly. The quantity of water ought to be such as to reduce the whole to the consistency of common mortar.

This cement disengages a great quantity of heat and ammonia. and should be immediately used. It is pressed forcibly into the joints, and after drying two or three days in the open air in summer, and from seven to eight days in winter, the pipes may be covered, with an assurance of their solidity.

In all the basins or reservoirs of the city, he used only this cement, and the joints prove to be as tight as if cast iron had been melted and poured into them, or as if the cisterns were made of glass. They stand in no need of repairs.

He recommends this cement in all cases of hewn stone and other solid works exposed to the weather, as in bridges, aqueducts, conduits, &c. [*Annales des Mines.*

Queries.

A correspondent requests information on the following points.

On what descent should a rail-road be constructed, one-third of the trade being ascending, and two-thirds descending, to be used with the greatest economy of power.

What is the greatest ascent on which a locomotive will draw up four times her own weight, and the rules for calculating such ascent.

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

OCTOBER, 1830.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN JUNE, 1830.

With Remarks and Exemplifications, by the Editor.

1. For a machine for *Boring and Withdrawing the Auger;* John Sneider, Tuscarora, Livingston county, New York, June 1.

A frame is made, in which a round iron spindle, or shaft, is placed vertically, revolving freely in its bearings. The lower part of the shaft is hollowed, so as to form a socket for an auger, the shank of which is also round, and made to turn freely in a hole through an adjustable piece at the bottom of the frame. A trundle, or lantern, is fixed upon the spindle, which forms its axis; the rounds of the trundle are of a length greater than the depth of the hole to be bored, so as to allow it to descend, with the auger, as it is turned by a vertical crown wheel. In order to withdraw the auger, the upper end of the spindle has a spiral groove cut along it, which forms a left-handed screw; by pushing a lever forward, a tooth takes into this groove, and on turning the crown wheel, the auger is withdrawn.

No particular purpose is mentioned to which this machine is to be applied, but it is stated that "if it be required to construct a machine for boring horizontally, and withdrawing the auger, the same principle will apply, by making some alteration in the relative situation of its parts."

2. For an improvement in the *Nail Machine*, called *Reed's Machine;* Jonathan Brett and Elisha Gilmore, Roxbury, Norfolk county, Massachusetts, June 1.

We are not aware of any difference in the improvement now patented, and that for which a patent was obtained on the 13th of last month, (May,) by Joseph Kearsey, of Plymouth, in Massachusetts. The machine upon which the improvement is made, is the same, and the object, and mode of attaining it, similar; there would be something remarkable in this if the patentees were antipodes.

---

3. For a *New Method of Blasting Rocks;* Moses Shaw, formerly of Nova Scotia, but now of the city of New York, June 3.

The mode of blasting rocks for which this patent has issued, was described in Professor Silliman's Journal, about a year since, (vol. 16, p. 372,) to which we refer our readers, as the account there given, though brief, is much more clear than the description supplied by the patentee, and the wood cut accompanying the former illustrates the design more perfectly than the very indifferent drawing which makes a part of the latter. The object proposed is to blow off very large masses of rock, by making a number of simultaneous explosions; to effect which a number of holes are to be bored, which may stand round in a circle, and be so inclined as to point to one common focus. A priming compounded of fulminating silver and gunpowder, is to be ignited by a shock from the electrical machine, there being a suitable arrangement of wires made for that purpose.

"Its superiority and usefulness," we are informed, "consists in enabling operators to burst off large masses of rocks, &c. by igniting a number of charges of powder at the same instant: the masses, or blocks, may also be made of more regular proportions than by the common method, and thus save much expense in the hewing of the stone, and in transportation. Much gunpowder may likewise be saved. These are its smaller advantages. Its great usefulness consists in being adapted to the clearing away of obstructions presented by mountains, in the routes of canals and rail-roads, and for this purpose may be of incalculable value to a liberal country."

To remove mountains, either by faith or by works, requires that either should be exercised with a degree of energy beyond the ordinary gauge of us mortals, in the present imperfect state of our moral and physical powers. We know the high anticipations of Mr. Shaw upon this subject, having heard him state them; we, however, were compelled to lag far behind him, probably because we imitate the many who "make mountains of mole hills," instead of exercising the rare talent of making mole hills of mountains.

We wish that Mr. Shaw's specification had been written by some one better acquainted with the subject of electricity, and with the other points necessary to a clear specification of this invention, than appears in the instrument before us. The result of the various experiments which have been made, with a view to the obtaining of a patent, ought to have furnished a more perfect detail than

has been given: at all events the particular points claimed should have been stated, and not left, as it now is, to be collected from the general tenor of the instrument.

---

4. For a *Timber Rail-road;* James Stimpson, Baltimore, Maryland, June 3.

We will begin our account of this patent with the *finale* of the specification, or rather of the claim.

"What I claim as my invention, or improvement, in the construction of timber rail-roads, is the elevation above the ground of the road-rails, and the timbers transversely to them throughout the whole length of the road, and their mode of combination, as set forth in the specification; they requiring but a slight support from the earth to keep them in an upright position, by means of the cross timbers being strongly confined to the road-rails, posts, &c. combined with the firm foundation of the road posts, effected by the secondary posts, which are driven into the earth, small stones under the stone blocks, or under the cast iron chairs, either kind to be used alternately, when the elevation of the road, or the nature of the earth may require it. Also the right of driving or sinking separate posts, or piles, from those connected to the cross timbers, whereby I obtain a firm foundation, and its security from decay, by their being sunk sufficiently below the surface for that purpose. Also the right to set posts upon the ground, and sink them alternately, or to step them upon cross timbers with braces, or upon stone blocks, or cast iron chairs, and to drive them deep alternately, for the necessary firmness against lateral pressure. Also the three rail tracks upon three rows of posts, cast iron chairs, and stone blocks alternately, as may be required by the nature of the earth, &c. Also the four rail track, upon three rows of posts, &c. Also the right of extending the cross timbers alternately through both tracks, or not, to save timber, as may be found best, in the four rail track, with four rows of posts, &c. Also the under rails for the one rail track, with the manner of setting the posts upon pile foundations below the surface, and upon cross sills with braces, stones, or iron chairs, alternately. Also reducing the tops of the posts to one size, and cutting the tops crowning; and also the shaping of the under sides of the transverse timbers to conform to the tops of the posts. Also the cast iron chair, or pedestal, secured upon small stones, or solid rammed or pounded earth, for a substitute for wood posts, or stone blocks, whereby the cross timbers and road-rails have a support without touching the earth. Also the right of wide timber rails, to save iron. Also the right of stepping the road posts upon cross timbers, and they to rest upon logs, lying upon the ground lengthwise of the road, secured by braces at different parts of it. Also the extension of posts to an unusual distance from each other, by the application of braces, &c. Also the wedges in the pins, as set forth. Also the two rail track, as set forth in the specification."

The space demanded by the claims will, we apprehend, be thought

quite sufficient, even by those of our readers who feel an interest in the subject of rail-roads; we, however, will add one or two remarks to render the nature of some of the claims more clear. The single rail is to be formed on the principle of one which has been patented and tried in England; the carriage is to hang on each side of the rail, the wheels being above, and in the centre between them; the lower rails spoken of are for lateral friction wheels to run against in case the two sides should be unequally loaded. In double tracks, with three rows of supports, the patentee makes the middle one of the three wooden rails, sufficiently wide for two wheels to pass each other. The wooden rails are to be covered with cast or wrought iron, or else they are to be made very wide, and the rims of the wheels also wide, to prevent their sinking into the rails. The patent in general is taken for things which are so simple and obvious that a man without the least talent at invention would resort to them because he had seen them used for other purposes every day of his life. We refer to such things as supporting an upright post by fastening it into a sill, and bracing it, and putting logs down for a sill to rest upon. If such a patent is good, no man will be left at liberty to follow the dictates of common sense, judgment, or observation, without permission from a patentee. If a post is to be used to support a rail, he will be told that he must not sink it in the ground, place its end upon an iron plate, (chair,) or upon a flat stone; that he is not to use a sill and braces, or employ timber of unusual length, or extraordinary width, as to do so is a special privilege.

---

5. For a *Thrashing Machine;* David Flagg, jun. Gardiner, Kennebeck, Maine, June 4.

Instead of one cylinder with beaters, as with most of the thrashing machines, there are to be two. We call them cylinders, although they are not properly so, the beaters being extended along from spoke to spoke, projecting from two hubs upon a shaft, like the rounds of a reel. In using the two revolving lanterns, the bars which form the beaters on one, pass into the spaces between those bars on the other, mashing in like the teeth of a cog wheel. Between these the grain is to be fed by a feeding apron. The beaters are placed one above the other. The claim is to "the application of two or more beaters acting together, as above specified."

---

6. For a "*Revolving Cotton Whipper;*" Elisha Baker, Warwick, Kent county, Rhode Island, June 4.

"The essential principle, or plan, of the Revolving Cotton Whipper, and which distinguishes it from the common cotton whipper, consists in the rotary motion, and the machinery connected with this motion, and especially constituting the improvement, are two vertical cylinders placed near each other; each cylinder being covered with projecting points, and these points being so placed on the cylinders, that when the cylinders revolve the points on the respective cylinders will meet and pass each other."

"The operation of the revolving cotton whipper is as follows, viz. power being applied by means of a belt to the pulley on the driving shaft, the two cylinders are put in motion. The cotton is introduced among the whipping sticks, through the hole in the top of the curb; and the extremely rapid motion of the whipping sticks very soon whips, picks, and prepares the cotton perfectly, and discharges it through the opening at the bottom of the curb."

The foregoing quotations comprise the first and the last paragraphs of the specification, and afford as good a view of the structure and object of the machine as can be given without the drawing.

---

7. For an improvement in the *Saw Mill;* Eli Mobley, Frederick town, Frederick county, Maryland, June 5.

We do not know in what part of the instrument described the merit of the invention, or the claim of the patentee, is to be found. After describing a machine of considerable complexity, we are told that "the *invention* here claimed is the combination of the several parts to construct the saw mill before described." The law requires that the invention should be made known "in such full, clear, and exact terms, as to distinguish the same from all other things before known," whilst the practice frequently is to obscure the thing by employing such general and indefinite terms, as may suffice to set the imagination at work, but which leave the judgment uninformed.

This mill, we are told, may receive its motion from the power of animals, water, wind, or steam. The saw frame, carriage, feed hand, and many other parts are to be made much in the usual way; but there is to be a cast iron fly wheel, and also a pendulum, in the form of a triangle, vibrating on one of its angles, its lower part being loaded with lead, or iron, and an arm extending above its point of suspension connected by means of a shackle bar, or pitman, with a drum, from which motion is to be communicated by straps to the fly wheel, saw frame, carriage, &c. &c. &c.

We commenced by acknowledging that we did not ourselves understand the merits of the machine, and must therefore claim to be excused if we do not make them known to others; perhaps, however, the light which may be elicited from the account of the operation of the machine may suffice for those who are blest with acute vision.

"*Operation.*—The timber after being properly prepared is fixed on the carriage on the frame: a vibratory motion is given to the pendulum;—this turns the crank which turns the drum;—the drum gives motion to the strap which turns the pulley on the axle of the fly wheel;—this last gives motion to the strap which turns the axle and crank, which move the pitman and frame up and down;—this again moves the carriage by means of the feeder, which is connected with the gate, and the saw which saws the timber."

"The *invention* here claimed is the combination of the several parts to construct the saw mill before described."

Should we ever build a saw mill, we shall carefully avoid the

combination above described, for although we are as ignorant of the forbidden portion of it as the disciples of Mahomet are of the unclean part of a hog, we shall still be safe, because we will never employ a pendulum to drive a crank, to drive a drum, to drive a strap, to drive a pulley, to drive a fly wheel, to drive an axle and crank, to drive a pitman and frame, to drive a carriage, to saw the timber.

---

8. For a machine for *Splitting and Manufacturing Hoops for Casks, Pails, Tubs, &c. and for Laths;* Ziba Bisbee, East Bridgewater, Plymouth county, Massachusetts, June 5.

A knife, or cutter, is to be fixed upon an iron bar, lengthwise, and at a distance from it equal to the intended thickness of the hoop. The knife is attached to the bar by bending its ends at right angles, like the cutter of a spoke shave, nuts being used to confine it in its place. A number of small knives, or slitters, pass through the stock from the upper to the under side, at suitable distances, until they meet the main knife transversely, and then divide the hoops into the desired width. Handles, to guide it, are fixed at each end of the iron bar, in the manner of auger handles, and a staple is fastened to the middle of the bar, to which a chain is attached, to draw it along the log, by water, or other convenient power. The whole instrument is considered as new, no part being claimed. The drawing which accompanies the specification is without written references.

---

9. For an improvement in *Axle-trees for Wagons and Carriages;* John A. Yerkley, Perry, Genesee county, New York, June 7.

On the 23d of April, 1828, Messrs. Phillips and Mather, of Genesee county, obtained a patent similar both in its object and means, to that of Mr. Yerkley. The specification, with a cut, may be found at page 349, vol. iii. new series. In that axle, the whole of the round part of the axle, which fitted into the nave, or hub, was of cast iron, with the exception of a pin of wrought iron inserted in the end when cast, for the purpose of being cut into a screw to receive a nut, for securing the wheel. These cast iron ends are affixed to a wooden stock by hoops and bolts. In the present instance, a part only, say two-fifths, of the round part is of cast iron, so much of the wood being cut off. The wood is then sawed from top to bottom of the axle, and a piece taken out, so as to leave an opening to receive a strap, or shank, cast on to the round part, and which is to extend back into the stock of the axle-tree, and be secured in its place by hoops and bolts. The lower edge of this strap thus operates as a skein to the wooden part of the axle. A wrought pin is directed to be inserted, as in the specification of the first patent. The present patentee makes no claim, and it really appears to us that the ground occupied by Messrs. Phillips and Mather, leaves him little, or none, upon which to found one.

10. For a "DETECTOR," *to make known a deficiency of Water in Steam Boilers;* Thomas Ewbank, City of New York, June 8.

(See specification.)

---

11. For an *Iron Tooth Rake;* Nathaniel Sanford and Erastus P. Parmelee, Meriden, New Haven county, Connecticut, June 8.

The object proposed is to form the head of a rake of iron so that it shall at the same time be cheap, light, and durable. The head is to be formed of sheet iron about $\frac{1}{16}$ inch thick, and two inches wide; the length being governed by the size required. About half an inch of the sheet iron is to be turned back at right angles, along each edge, so that its section will appear thus]. The top of each tooth is to pass through a hole in the lower of these ledges, and to be rivetted into another hole in the upper ledge. In the middle of the plate a socket is to be fixed, for the handle to pass into. It is proposed, sometimes, to bend the sheet iron round, so as to form a tube, through one side of which the teeth are to pass, and be rivetted into holes made in the opposite side. The specification is of considerable length, but these are its leading features.

The claim is to the shaping the piece which forms the head, in the manner described, so as to insure a great degree of strength, with the desired lightness; the teeth having two bearings, or resting places, at the top and bottom, which secures them permanently.

---

12. For an *Inclined Plane Wheel, or Projectile Lever Power;* George Wood, Vernon, Jackson county, Indiana, June 9.

The title of this patent is a true indication of its utter worthlessness. An inclined wheel for animals to walk upon, as we suppose, (there being a wheel called the "big tread wheel,") is to carry a large cog wheel, which after three or four other gearings to wallowers, wheels, and levers, is to drive a saw, or any thing else. The drawing is in keeping with the so called *improvement*, the latter violates the established laws of mechanics, the former those of the graphic art.

---

13. For a *Plough;* Jacob Yeager, Mifflin Township, Dauphin county, Pennsylvania, June 9.

The wood work and coulter are to be made as usual, but the mould board, and the mode of attaching the parts together, are claimed as novelties. We hear nothing further respecting the *form* of the mould board, but are told that it is cast in one piece with the land side, and are then informed how the heel of the land side, and some other parts, are fastened together.

---

14. For a *Stove and Open Fire-place*, for burning anthracite or other coal, connected with a cooking apparatus; Anthony Savage, Pottsville, Schuylkill county, Pennsylvania, June 10.

The claim in this patent is to "the combination and arrangement of the several parts of this apparatus," which combination and arrangement so closely resembles a number of other cooking stoves, as to require more tact than we possess to discover their novelty. There is a grate in the middle for containing the fuel, over which may be placed pots, pans, &c.; an oven on one side, of sheet or wrought iron, with shelves upon which to place dishes, and a flue running round it, for the passage of hot air and smoke; on the other side there is a boiler, with a cock to draw off the water, and a cover to keep out the dust, and, according to the drawing, the whole is to be set in brick work.

---

15. For a *Brick Press,* called the "Bridle Brick Press;" Julius Willard, Baltimore, Maryland, June 10.

The brick press, above named, is well described and figured, but its necessary complexity will not admit of our giving any thing like a clear idea of its structure without a drawing. The description and claim both refer, by letters, to the drawing which accompany them. The machine appears to have been well imagined, and, judging only by the evidence before us, we are prepared to hear a good account of its performances.

---

16. For an improvement in the *Mode of Sawing Wood for the Fire;* James Hamilton, City of New York, June 10.

There are few things which have been more frequently proposed, than the construction of a "portable sawing machine for fire wood." A little reflection, however, has generally led to the conclusion, that such a machine would not, under all circumstances, prove to be of any real service. However *portable* it may be made, it must be very inferior in this respect to the horse and saw, as usually employed. The present patentee, of course, thinks differently, but he has not succeeded in converting us to his opinion, although he has placed the subject before us by means of a very good description and drawing.

A strong frame must be made to sustain the apparatus. An iron cog wheel is turned by means of a crank; this takes into a smaller wheel, upon the shaft of which there is a fly wheel, and a crank attached to a pitman for working the saw. The frame of the saw, together with the guides within which it slides, are capable of being turned up, to replace the sticks or logs as they are cut. A horse, or buck, (as it is called in New York,) stands upon the frame, to receive the log, which is to be confined upon it by means of a lever. The claim is to the particular mode of construction, as described in the specification.

We have seen an expert sawyer cut eight cords of wood in a day; now we apprehend that the machine described would not effect this with the aid of two men, after it had been hauled to the place of its destination. We greatly err, or the patentee will find that he has expended more thought, labour, and money, on the present scheme, than its returns will justify.

17. For an improvement in *Gasometers,* [Gas Meters;] Henry B. Williams, Baltimore, Maryland, June 11.

Instead of a gasometer, as the instrument is called in the specification, the patent is taken for an improvement in the gas meter. The former is a large reservoir, or vessel, for containing the gas at the works, the latter a small instrument placed in a house, to measure and register the number of cubic feet of gas burned. In the machine generally used, this is done by causing the gas, as it passes through the instrument, to turn a small tin water wheel, which gives motion to a train of wheels, terminating in an index on a dial plate. From leakage, or evaporation, the quantity of water in the instrument is liable to vary, when its indications become inaccurate. The improvement now patented is intended to remove this difficulty, by causing the water always to stand at the same height, which is to be effected by placing a reservoir to supply any waste which may occur.

---

18. For an "*Explosion Guard," to prevent accidents from the bursting of Steam Engine Boilers;* Joseph Loughead and Thomas B. Chapman, Philadelphia, Pennsylvania, June 11.

This guard, we are told, "is calculated only for steam boats whose boilers are placed at the side of the boat," and is "simply a strong partition of wood, iron, or other suitable material, open at top, and at the side next the water, and placed between the gangway and the two ends of the boiler." The plan of using strong bulk heads was one of those recommended at the time when steam boat explosions first arrested the public attention. That they would in many instances prove safeguards, is not doubted; but they would have been of little avail in those violent explosions which have torn up the decks of vessels, or have carried boilers, or parts of them, through stone walls. In the placing of boilers on the sides of a boat much is done to lessen the risk to passengers from an explosion, and such guards as are here recommended would certainly lessen it still further, but it would be no easy task to erect a partition which would resist the direct force of such explosions as have frequently occurred. We do not perceive in what the merit of the present invention consists, as it merely proposes to apply upon deck, a security which has been a thousand times recommended between decks.

---

19. For a *Thrashing Machine;* John Peters, Harrisburg, Dauphin county, Pennsylvania, June 12.

The cylinder and concave segment are both to be of iron, with teeth cast upon them; the manner of working the machine, the mode of feeding, and, indeed, every thing essential in its structure and operation have the sanction of long usage; the claims, therefore, have to be made upon the mode of fastening it together, and some other things in themselves unimportant, and which may be equally well done in twenty different ways.

20. For *Spring Scales* for weighing merchandise; Daniel Klanberg, City of New York, June 12.

A strip of brass is attached by its upper end to a steel spring, supported on a suitable stand. From the lower end of the strip hangs a scale, into which the article to be weighed is put; this causes the spring to bend, its descent being proportioned to the weight in the scale. To ascertain the amount of this, the strip of brass is graduated on one side, and being made to slide through a mortise in a metallic plate, the weight is read off on the surface of the plate. We have yet to learn in what respect this spring balance is superior to those formerly used, but not approved.

---

21. For an improvement in the mariner's and surveyor's *Compass Needle;* Moses Smith, City of New York, June 15.

(See specification.)

---

22. For a *Washing Machine;* Robert C. Arnold, New Haven, Connecticut, June 15.

A dasher, or paddle, perforated with holes, is made to vibrate in a tight box, by a handle, or lever. At each end of the box is a board which is also perforated; between the dasher and these boards the clothes are to be squeezed until they are perfectly clean. There are certain uncertain claims, for which we have not room at present.

The drawing is without written references.

---

23. For a "*Geometrical Protractor and Tablet;*" John Pool, jr. Easton, Bristol county, Massachusetts, June 16.

The above named instrument consists of a quadrant, or other segment of a circle, having a straight limb, or protracting rule, moveable upon its centre. This is to be applied to the edge of a common square drawing board, in the manner of a T square, or rather in the manner of a bevil. A short arm of the straight limb, or rule, furnished with an index, extends upon the graduated segment, and enables the draughtsman to place it at any required angle.

The claim is to "the protracting bar, limb, or scale, connected with, or applied to any segment of a circle, or other geometrical figure, graduated as may be required, and applied to a drafting tablet with the utmost accuracy, for the use of surveyors, navigators, or other geometrical operators, or draftsmen, requiring the correct admeasurement of lines and angles."

Similar instruments have repeatedly been made for the use of draughtsmen. There is one figured in Plate 2nd of Adams' Geometrical Essays, and called a "Protracting Parallel Rule," which is calculated to answer all the purposes of the foregoing, and some others. The late Thomas Whitney, mathematical instrument maker, of Philadelphia, made protracting rules upwards of thirty years ago, precisely like that described by Mr. Pool.

24. For a *Machine for Washing, Cleaning, and Drying of Grain;* Gilbert Arnold, Angelica, Alleghany county, New York, June 17.

The grain is conducted into a vessel in the form of a hopper, into which water is also allowed to run, so as to overflow the vessel, and carry with it the light stuff, whilst the remainder of the grain, with a portion of the water, is delivered at the bottom of the hopper, into a vertical tub, in which a revolving agitator washes it completely; from this tub it runs into a revolving wire screen, inclined like a bolter, by this it is conducted into an iron cylinder, surrounded by mason work, and heated by flues; when delivered from this cylinder it is said to be fit to grind.

The apparatus is pretty well figured, but otherwise very imperfectly described. There is no claim to any part, the whole, as applied, being probably considered as new.

---

25. For a *Washing Machine;* Ebenezer Horton, Avon, Livingston county, New York, June 17.

Notwithstanding the strong characteristic resemblance which exists between the leaves of any particular tree, it will be found upon close examination that each leaf differs from its fellow; it has a vein, a notch, or a curvature which marks its identity; if such be the fact as regards the millions of leaves upon trees of the same species, it will readily be believed that the analogy may be extended to washing machines, which are counted by the hundred only. Although in the present instance we have a fluted bottom to a trough, and a fluted roller passing over it with a pendulum like motion, communicated through the intervention of a handle, we much doubt the existence of a machine so perfectly similar, that their portraits could not be distinguished; further we cannot say.

---

26. For improvements in the apparatus, and in the process for *Manufacturing or Preparing Soda Water;* George Ott, Norfolk, Norfolk county, Virginia, June 18.

The claim of the patentee will exhibit the nature of the improvements for which this patent is obtained.

"What I claim in the foregoing apparatus, and in the mode of procedure, as my invention, is the manner in which I employ block tin, or an alloy of block tin, to conduct and retain the water, and gas, of soda water, to prevent the deleterious effects experienced from other metals. I also claim the covering of brass, copper, or other metal, with block tin, by fusing, or casting it thereon, so as to leave it in a body greatly exceeding in thickness that produced by tinning. I also claim the expelling of water from the cistern, by carbonic acid, in order that the chamber of condensed gas may consist entirely thereof."

The cistern for containing the soda water is to be made of block tin rolled out, and soldered together; this is to be enclosed in a ves-

sel of wood, strongly hooped, and the heads confined by bolts of iron; the interval between the metal lining and the wood, is to be filled with cement. Sometimes the cisterns are to be made entirely of wood, strongly bound, and lined with an impervious cement. In all cases the connecting pipes, &c. are to be of block tin.

---

27. For a machine for *Gumming old, or Cutting the Teeth of new Saw Mills and Cross Cut Saws;* Phineas Newton, Sidney, Delaware county, New York, June 19.

This machine for cutting saw teeth is a species of lever cutting press, which, although it has but little claim to novelty, will undoubtedly answer the purpose intended in a very perfect manner.

There is a bed plate of stout iron, which may be bolted down, horizontally, upon a solid platform. Upon this platform is placed a sliding bolt, with cheeks, or guide pieces, to keep it in its place; one end of the bolt is triangular, and is made of hardened steel; this operates as a punch, or die. A steel plate, supported by a strong iron bracket, stands at right angles with the bed plate, first mentioned, and has a triangular perforation, into which the die fits, and which forms its bed. The bolt is forced forward by a lever, the long arm of which measures 8 or 10 feet, the short one $1\frac{3}{4}$ inch. A saw passed between this bed and punch may be readily cut. The instrument has no claim to novelty, nor has the patentee preferred any claim whatever.

---

28. For a *Furnace for Burning Stone Coal, Charcoal, &c.;* John Estlin, Philadelphia county, Pennsylvania, June 19.

A square box, of sheet or cast iron, is to have an ash pit and grate, is to be lined with fire brick, and should be furnished with a stove pipe, with an elbow, if thought proper. When a fire is made within this furnace, water may be boiled over it, and other calorific effects produced, somewhat resembling those produced in other furnaces of a similar construction. What more can be expected or desired?

---

29. For an improved *Vertical Steam Boiler*, for locomotive, stationary, and steam boat engines; Ezra L. Miller, Charleston, South Carolina, June 21.

We do not see any thing of particular novelty in this boiler, but merely an arrangement of the parts varied in form, but not in principle, or object, from many which have been made. The boiler is cylindrical at the part immediately over the fire, then conical, and then again cylindrical, and from three to ten feet in height. From the lower head of the cylinder, pipes descend into the furnace, to allow the flame and heated air to play among them, and to heat the water which they are intended to contain. The flame and smoke have their exit through several flues which pass up in a casing that

surrounds the boiler, and are themselves to be surrounded by water. A main chimney is to be extended up above these.

"The great height of the fire-place, and the division and conducting the smoke and flame, as it reverberates from the top of the furnace to the outside of the boiler, are important parts of this improvement, and are, together with the whole general plan and shape of the boiler, what I claim as my invention."

---

30. For an improvement in the *Art of Silvering and Gilding Leather;* Levi Kenton, Philadelphia, Pennsylvania, June 21.

The patentee has not told us what there is new in his process, and we apprehend that there is a very good reason for the omission. The leather is to be sized, or glazed over, is then to be slightly greased, after which the leaf is laid on, and the leather embossed, by passing through rollers, properly heated, in the ordinary way.

---

31. For an improvement in the *Construction of Fire-places;* Ebenezer Lester, Killingworth, Middlesex county, Connecticut, June 21.

We do not understand the description given of this improvement, as it is said to be. Within the jambs of a fire-place the hearth is to be raised to the height of two inches above that part without the jambs; upon this elevation two others are to be made, forming a ledge, or step, along the side of each jamb, from the front to the back. Upon these ledges, which may also be two inches high, the wood may be placed; or if coal be burned, a grate may be supported by them. We are then told of an air flue, along the back, between these ledges by which the draft of the fire is to be supplied; but whence this air is to be derived we are not informed.

"The inventor does not hereby claim as his invention fire-places, flues, hearths, nor jambs," (that is well,) "but merely the manner of improving them by the addition of the beforementioned means."

---

32. For a *Cooking Stove;* Andrew C. Betts, Westmoreland, Oneida county, and Eli M. Gibbs, Norwich, Chenango county, New York, June 22.

The only drawing given is a wood cut representing the exterior of the stove, which is so similar to many others, that nothing seems to be lost from the absence of sectional views.

The claims are to the particular arrangement of the parts, which arrangement we do not think it necessary to detail.

---

33. For a machine for *Grinding or Preparing Clay for Bricks,* and for moulding and pressing the same; Nathaniel Adams, Cornwall, Orange county, New York, June 22.

The clay to be prepared is put into a circular trough made in the usual manner. A horizontal shaft, attached to a vertical one, is

drawn round by a horse. The horizontal shaft is cylindrical, and has upon it a hub, or nave, which revolves round it; from this hub twelve or more spokes project, these are furnished with knives on their ends, and, as they pass round in the trough, the knives cut and prepare the clay.

The press is a rack and pinion press; the bed upon which the moulds rest is brought under the follower, by a rack and pinion working horizontally.

"The follower is made of two iron plates about 6 inches wide each, and about 21 inches long, which are fastened to a bar of iron crossing lengthwise the box, making a joint in the form of a door hinge, or butt, which after pressing all the clay out of the box, will shut up by raising the press, and open again by the spring hooks aforesaid."

"What I claim as my invention is the mode of pressing, and the follower, as before described; likewise the revolving grinding machine, with the knives attached to them."

---

34. For an improvement in the mode of *Raising, Straightening, and Laying the Nap upon Woollen Cloths,* and cloths upon which a nap is commonly raised by teasing. Thomas Hurd, City of New York, and Jesse Fox, Lowell, Middlesex county, Massachusetts, June 23.

The machinery for which this patent is taken, is described at great length, and represented in a number of different drawings. The main object of the patentees will be seen by the annexed quotation, which comprises the concluding part of the specification.

"And as metallic wires are set and fixed, in the manner of the common cards, in leather, or felt, at a considerable distance from each other, upon a plane, or upon a cylindrical surface, have heretofore been used for the purpose of teasing and raising a nap upon cloth, it is to be distinctly understood that wires so set, and such cards, and the setting or fixing of wires, or pins, in such manner as last aforesaid, or in any manner in which they have heretofore been set and used for the purpose aforesaid, is not claimed as a new invention; the chief advantage arising from our invention consisting in the setting and fixing of pointed metallic wires, pins, or points, or wires or pins so small that the ends may serve for points with little or no sharpening, in a firm manner in frames, or in or upon metallic plates, or in or upon a metallic substance, or any substance in or upon which they may be set, and fixed with sufficient firmness, comparatively closely, or very nearly together, and much nearer to each other than they have heretofore been placed, set or fixed, in any such cards, leather, felt, or otherwise, so that the points may the better serve as gauges to each other, act upon many points of the cloth at once, require but a light touch, or pressure of the cloth upon them in order to accomplish the work, and without taking such rank hold upon the cloth as to injure it, raise a nap uniformly thereon, with much more facility and expedition, and in a far better man-

ner than can be done by the cards or teazles aforesaid, or any mode or means hitherto in use. And notwithstanding that we have mentioned and recommended the application of heat, steam, and water, in the operation, and described a mode of operating, and machinery which is deemed advantageous in the use of our inventions, but which may be used or not, or varied at the discretion of the mechanic or operator, and which a mechanic of ordinary skill will readily understand, we hereby nevertheless explicitly declare that what is claimed by us as a new invention and improvement, and all which we the said Hurd and Fox claim herein, as our original invention and improvement, is the setting, placing pointed metallic wires, pins, or points, and wires so small that the ends may serve for points with little or no sharpening," &c. &c.

The remainder is a formal repetition of what we have given above, and need not, therefore, be copied.

---

35. For a *Thrashing Machine;* Squire Gambell, Onondaga, Onondaga county, New York, June 24.

The usual beaters on a cylinder, a concave segment, and springs to allow for variations in the quantity of grain, are again congregated, and patented. No claim is made. Would it not be worth while to have a printed form for the use of those who wish to patent such machines? there need be but few blank spaces, and according to present appearances, the number which will be required will be, at least, equal to that of the counties in the union.

---

36. For *Making Roving in Cotton Spinning*, by means of a machine called a "Speeder;" Samuel P. Mason, Leesville, Middlesex county, Connecticut, June 24.

Those acquainted with cotton spinning are aware that several patents have been taken for *speeders*. The specification of the present refers throughout to the drawings, which are complex. There is no claim, and in such an apparatus this appears to be an essential defect.

---

37. For a *Rail-road Carriage*, to be worked by manual power; Joseph V. Hughes, Pottsville, Schuylkill county, Pennsylvania, June 25.

This rail-road carriage is well calculated to give ample employment to the man who is to propel it, as there are 12 cast iron cog wheels, with their proper axles, and two endless chains, each passing over three of these cog wheels, which are geared together to convey motion to the carriage wheels.

The manual power is to be applied by taking hold of a vertical lever, which is to be made to vibrate backward and forward by the man, or men, employed. This lever gives motion to a shaft, which by the aid of two connecting rods, or pitmen, operate upon cranks, acting upon the whole train of wheels, axles, and chains. To aid in the operation, there are two fly wheels "of any convenient size and

weight, to give a uniform motion to the whole, and to carry the cranks past the centre."

"The *invention* here claimed is the whole of the rail-road carriage, as before described, to be moved by manual power."

We think it unnecessary to animadvert upon the general *merits* of such a plan; the mere application of fly wheels to a carriage of this kind gives to it a *nullifying* aspect.

---

38. For an improvement in *Finishing Paper;* Thomas Gilpin, Philadelphia, Pennsylvania, June 25.

(See specification.)

---

39. For a *Washing Machine;* David Stocking, Scott, Courtland county, New York, June 25.

In this machine there is a cylinder which has fluted rollers on its periphery; a wash board, or bed, made concave, and having rollers on its face, stands in a trough under the cylinder. Both the cylinder and board are borne together by springs. By turning a crank alternately backwards and forwards, with the clothes between the cylinder and the board, the washing is to be effected. There is no claim.

---

40. For a *Machine for Churning and for Washing Clothes;* Hezekiah Kingsbery, Hebron, Tolland county, Connecticut, June 26.

Although churns have been patented in numbers, it is some time since the churn and the washing machine have been presented under one claim. On some former occasions the two operations have been so blended in the description as to induce some fear that they might be essayed together; in the present case, although the structures are to be alike in plan, they are to vary greatly in size.

In either case two dashers, hung on pivots, are to be made to vibrate in a conical box, by means of a lever on the top. In the washing machine, these vibrating dashers are to press the clothes against boards perforated with holes.

As there is no claim made, we do not know what the patentee supposes to be new in his churn and washer; we think any further description unnecessary.

---

41. For machinery for *Transporting Manure, Sand, and other Earth, by means of a Self-loading Car;* Isaac Beach, Dryden, Tompkins county, New York, June 28.

This is a wagon with machinery attached to it for raising manure, or earth, from the ground, and loading it into the wagon. Why it is called *self*-loading, we know not, as the stuff is to be raised by a windlass, operated upon by a crank. The description of the structure is very obscure, a defect which the drawing does not remove;

we, however, collect this much from it: there is a frame erected above the body of the wagon, to support the cranks and other appendages; two instruments are to be let down, something like two rakes, or rather like oyster tongs, with their teeth towards each other: when down, they are to be opened by hand, and are to embrace a quantity of manure between them; they are then to be drawn up by the crank and windlass, and the manure dropped into the wagon. If it is intended to load sand, &c. instead of teeth, or tines, shovel formed pieces collapse together, and are drawn up. There is no claim.

Were we to animadvert upon this invention, we might perhaps be told by the patentee that we did not understand it; pleading guilty to the charge, we should reply that this is no fault of ours, as our eyes are not so penetrating as to enable us to see through a mill stone before it is perforated. If the machine is a good one, we wish, for his own sake, that the inventor had introduced it to us in a clearer light.

---

42. For an *Apparatus for Securing Baggage on Post Coaches,* and other carriages; Charles Stratton, Greenfield, Franklin county, Massachusetts, June 29.

The security proposed to be effected is of two kinds, first, from jolting loose, and secondly, from rain. The first is to be accomplished by using spiral, or other springs, attached to the straps, which by their reaction are always to embrace the baggage closely. The second purpose requires that the baggage should be covered with canvass, prepared by applying a coat of India rubber to it. "This canvass not being original with the subscriber, all that is claimed is the application of it to the purpose of protecting baggage from the weather." There is no claim to the elastic springs. The claim to the prepared cloth, is to the right of applying it to the purpose of keeping out water, a purpose which is the sole intention of its manufacture; how this, therefore, can be accounted a new application we cannot tell.

---

43. For a *Thrashing Machine;* Asher Slover and William Sparey, City of New York, June 29.

This thrashing machine is intended, principally, for clover seed; but its general construction is the same with the greater number of those heretofore patented.

A cylinder is to have beaters along its surface, and is to work in a hollow segment, which may be fluted, or checked. The rubbing is to be aided by strips of sole leather, laid along between the beaters. The cylinder and segment are both to be solid, as, it is said "their being in one entire piece constitutes the most important part of the invention as claimed; for the air which is set in motion by the great velocity of the cylinder, instead of passing between the bars, as in the ordinary mode, is condensed within the concavity, and greatly assists the thrashing, particularly of clover seed."

The rubbing floor, or segment, is supported upon spiral, or other springs, which bear it up against the cylinder.

Excepting in the part above quoted, where the beneficial influence of the confined air is mentioned, there is not any thing in the form of a claim. The effect is probably as stated, but in numberless instances the cylinder and the segment have been each made in one entire piece, and important as this may be deemed by the present patentees, it is not new, and any claim to it must stand upon a very insecure basis.

---

44. For a *Machine for Spinning Wool*, by eight spindles, or more, called "The Farmer's Handy Maid;" John Pierce, Yorkshire, Cataraugus county, New York, June 30.

There has been a long truce with the "Domestic Spinners," although patents for such machines were issued in numbers two or three years since. Should the present application be the harbinger of an improving state in our household manufactories, we bid it welcome, whether new or old, as we love the bearers of good tidings. Most articles from the spindle and the loom have of late been sold at prices so far below their intrinsic value, as nearly to banish domestic spinning and weaving from the farm house; and, of course, there has been little or no demand for machines like that above named.

Whether this "Farmer's Handy Maid," is really more handy than some other maids and "Jennys" previously introduced to our acquaintance, may very fairly be doubted, as the similarity in its features indicates a great similarity of disposition and habits. These domestic spinners are generally mere epitomes of the larger machines, and such we account that under consideration. There appears to be a strong conviction of this fact in the minds of patentees, as they have rarely attempted to point out the parts which they considered as new. The same course has been adopted in the present instance, no claim being set up. Such an omission must be fatal to a patent of this description, as most of the parts of a spinning machine must be similar to those previously used.

Specifications of American Patents.

Specification of a patent for machinery for detecting and making known a deficiency of water in Steam Engine Boilers. Granted to Thomas Ewbank, *City of New York, June* 8, 1830.

At any convenient place on the top of a boiler, a hole is drilled through, and a stuffing box is properly fixed to it, to admit a smooth metallic rod, of about half an inch diameter, to slide easily through it in a perpendicular direction, and without letting out the steam. The length of this rod may be about a foot greater than the distance between the top of the boiler and the surface of the water in it, when at its proper height.

The lower end of this rod is attached to a float properly made to rise and fall with the water in the boiler, and sufficiently heavy to overcome the friction of the rod through the stuffing box. The upper part of the rod, that is, from its top to a little below where it enters the boiler, is made hollow, and a small hole is made into it laterally, or at right angles to its length, near the bottom of the hollow part, and so as to communicate with that part; this hole, which is to be about one-eighth of an inch in diameter, is made at such part of the rod that when the water is at its proper height, this hole may be about half an inch above the boiler; or above that part of it where it comes in contact with the steam; so that when the water sinks half an inch in the boiler, the float and rod will sink also, and consequently bring the small hole inside of the boiler, through which the steam will rush into the hollow part, and escape at top, making known by its noise a deficiency of water within. To increase this noise, a boatswain's whistle, the mouth of an organ pipe, a trumpet shaped tube, or other suitable instrument, may be fixed to the top of the rod, as circumstances may require. The diameter of the rod should be the same throughout its length. The part of the rod outside of the boiler may be graduated, so that by it the depth of water within may be always known; and that as well when it is below the gauge cocks as when it is above them.

When it is desirable to avoid the friction of the stuffing box, I use a rod of the same length, but solid throughout, and about three-quarters of an inch in diameter; one end of this, for the length of ten or twelve inches, I turn down till it is only half an inch in diameter, making that part of it conical where the small part joins the larger; this conical part forms one-half of the valve, the corresponding part is properly fixed to the top of the boiler, with its face inwards, and a hole is drilled through its centre, which admits the small end of the rod to pass through, till the conical part comes up, and thus renders it steam tight. The lower end of the rod is attached to a float, as before mentioned, so that when the water sinks in the boiler, the float and rod sink also, and consequently open the valve, through which the steam then escapes, and gives, by its noise, notice of the fact.

It is to be observed in the construction of this valve, that that part of the rod inside of the boiler, which connects the float to the valve, should be of one thickness throughout its length, and its diameter the same as that of the face of the valve. For if the area of the face, or closing part of the valve, be greater than the rod's diameter, the pressure of the steam upon it, over and above that upon the rod, would be in proportion to this difference; and this pressure would also vary as the density of the steam in the boiler changed; and consequently it would derange the action of the float, and might prevent the valve from opening, even after the water had sunk below the float; and, on the contrary, should the rod below the valve be made larger than the face of it, the steam would have a constant tendency to open it, whatever might be the quantity of water in the boiler.

I claim as new, and as my own invention, in the above described

machine, the hollow part of the rod, with its lateral opening, or openings; also the suspending the float to the moving part of the inverted valve, by a rod of the same diameter as the face of the valve, by which means the float and valve rise and fall with the water in the boiler, uninfluenced by the steam within it. THOMAS EWBANK.

Description of the Drawings.

The corresponding parts in Figs. 1 and 2, are represented by the same letters.

A, A, the boiler.

B, B, the height at which the water ought to be kept within it.

C, C, the surface of the water below its proper level, and bringing the machine into action.

F, F, floats, which may be of stone, or other suitable material. The rods to which they are attached may be connected to a lever, L, and counterpoised by a weight, W, as shown in Fig. 1.

R, in Fig. 1st, represents the hollow rod, passing through the stuffing boxes, with the lateral opening at O.

V, the inverted valve seat, T, the tapering, or conical part of the rod, completing the valve.

Fig. 1.

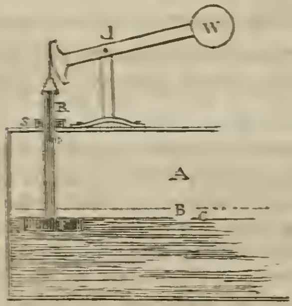
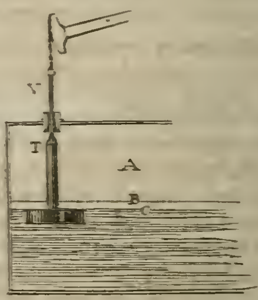


Fig. 2.



Remarks by the Editor.—It has become an object of immense public importance to devise some mode of greatly lessening, should it not be possible entirely to prevent, those fatal accidents from explosion, which have so frequently occurred, especially of late. As the public attention has been aroused to this subject, numerous plans and opinions will be presented to our consideration, and we shall deem it the wisest course to abstain, at present, from any critical remarks upon them individually, excepting in those cases where they appear to be marked with absurdity on their fronts. To others we do not prescribe the same course, but earnestly invite the most free discussion and inquiry upon a point of so much interest.

In our last number, page 157, we gave a description of the plan invented and patented by Mr. Potts, for attaining the same end with the foregoing; the distinctive difference between the two, is the self-regulating action of the supply pump, which Mr. Potts aims to accomplish by the falling and rising of the float in the boiler.

Mr. Ewbank is incorrect in his reasoning about the equality in the size of the rod below the valve, in his second plan; this is a point of no importance whatever; the two forces which operate, are the pressure of the atmosphere without, which will be in the proportion of its weight, and the area upon which it presses; and the elastic force of the steam within, and the area upon which it presses; the former area is the section of the rod, and the annulus of the cone, formed by the space allowed for the escape of the steam; the latter will be what is due to the elasticity of the steam, and the horizontal area of the valve seat.

Any enlargement or contraction of the rod, below the valve seat, will have no more influence upon the pressure of the steam than will the area of the upper surface of the float, the pressure upon which is balanced by the pressure of the water upon its lower surface. The space contained between two circles struck from the centre of the under side of the float, the smaller of which is equal in diameter to the hole drilled through the valve seat, and the larger to the diameter of the lower part of the cone of the valve seat, will represent the area acted upon by the steam, without being counteracted by the atmosphere; from the area of the inner circle must be subtracted the pressure of the atmosphere upon an equal surface.

Specification of a patent for an improvement in the mode of Finishing Paper. Granted to THOMAS GILPIN, *Philadelphia, Pennsylvania, June 25th,* 1830.

I CONSTRUCT a roller, to be made of paper compressed upon an iron shaft, and then turned on the surface perfectly smooth and true, in the same manner as those are made which are used for the callendering of cloth and cotton goods in the usual manner, as well known, and I suspend the same in a frame usually made of iron, with adjusting screws over the Journals, to press down the same and regulate the pressure as required; and I also provide an iron cylinder perfectly smooth on the outside, but so large as to afford room to be hollow in the inside for the admission of heat conveniently; say from four to eight inches diameter, and this said hollow iron cylinder is to be suspended in the same frame as the aforesaid paper roller, and may be put immediately below the same, so that by the pressure of the screws, the paper roller may be let down upon the same, and then, when a power is applied upon a pulley in the well known usual manner, either from a revolving strap or cog wheel, to the said hollow cylinder, or paper roller, as convenience may dictate, the two rollers are to be brought into contact, and will revolve together. Heat may then be introduced into the iron roller by iron or other heaters, or by steam. The paper may then be passed between the two rollers and be pressed, and to obtain this pressure by the said process, consists my said art or invention. The degree of pressure as well as the skill of managing the same, is to be left to the further experience of the workman.

I have also constructed another machine to effect the same purpose of rolling paper, by using two paper rollers in a similar frame to the above, to move together in contact with each other, so as to admit the paper to pass between them, and in this process I either use the two paper rollers together, or I use them with an iron roller between them, as may be most eligible, but the process I consider as analogous to the preceding.

I have found it necessary also to add a useful instrument to the above invention for the purpose of securing the paper, as it is passed between the said rollers, from injury by creasing, or running unevenly, which instrument I call a conductor.

It may be made in a variety of forms, and such an instrument cannot well be done without in this application and process. The form I have used it in, is by having a flat board suspended horizontally upon axles, with two wheels on each side, upon which the paper may be laid. I have then an open frame made to surround the said board, and suspend the same on the two sides or pivots, the end or side of the open frame next to the rollers rests upon the said board, and the other end or side comes underneath the said board, so that it may be pressed up to it by the hand, the end next the rollers will then come down upon the board, and the sheet of paper when laid upon the board is to be shoved, or pushed forward upon it, but under the end of the open frame which is above the board, and by which it may be pressed and gripped, as by a pair of tongs, and kept smooth as it is drawn forward from the conductor into the rollers; this end of the open frame had better be wrapped round with a woollen cloth. The effect of squeezing or pressing the paper evenly throughout the whole sheet, so that it may be delivered in an even manner into the rollers by any process, is part of my discovery, as it has never been done in any manner; and I describe the above as one way I have adopted to effect it. It may be done also by pressing a straight edge or cushion up to one of the rollers, and passing the sheet of paper between the straight edge or cushion, so as to gripe the paper against the roller in order to pass it evenly into the action at the contact of the rollers. Another part of my invention consists in fixing a permanent iron bar, or rod, opposite to the contact or conjunction of the two rollers, so that accidents may be prevented by things going into them, or persons being caught and hurt by them; the said bar to be connected to the standard or sides of the iron frame in which the rollers are suspended. Thomas Gilpin.

Specification of a patent for an improvement in the Mariner's and Surveyor's Compass Needle, and the mode of using the same, by means of a metallic cap, or feeder, on each side of the centre, and of an electric rod, of brass, or other suitable metal, or material. Granted to Moses Smith, *City of New York, June* 15, 1830.

The needle to be used may be hung in the usual manner; it should be rather heavier than that now in common use: the poles of the

needle should be of a uniform breadth and thickness, with a small point at the extremity, which, in the mariner's needle, may be placed on the end, which should be a little rounded, so as to admit the cap, or feeder, to be placed as near the end as may be. On each pole of the needle should be placed a sliding cap, or, as I consider it, a feeder, to be made of soft iron, or other suitable metallic substance, which may slide, or be moveable from the centre, to the extremity of the needle. This cap may be formed of fine soft iron wire, or other suitable wire, of a size suitable to the needle, and may be of a breadth, computing from the centre to the extremity of the pole of the needle, of about one-sixteenth part of the length of the pole, or of a greater or less breadth as circumstances may require; or the cap may be made of a thin plate of soft iron, or other suitable material of the same breadth.

This cap, or feeder, must surround the pole, in contact with it, and slide thereon, as easily as is consistent with the retention of the place in which it is placed.

When any attraction foreign from the polar attraction occurs, or is apprehended, such as from cannon, or other iron on ship board, or beds of iron ore on land, or from other substances, the caps, or feeders, must be moved as near to the points of the needle as they can go, but not so far as to cover the point. By this the foreign attraction upon the needle is greatly lessened, if not entirely destroyed; and when such foreign attraction does not require to be counteracted, the caps should be moved towards the centre, to render the needle subject to the polar attraction in the usual manner. When the needle is out of use, the caps should be placed at the ends, so as to preserve the magnetic power.

I do not claim any exclusive right, as inventor, to the form or material of the needle, or point, but only to the application of the cap, or feeder, to the mariner's or surveyor's compass needle, and its use as before described. The electric rod for a mariner's compass needle, may be made of brass, or other suitable material, about ten inches long, and a quarter of an inch in diameter, or of any other suitable material, about ten inches long, and a quarter of an inch in diameter, or of any other size which may be capable of giving the shock hereafter described; and the electric rod for the surveyor's compass needle, may be of half the above size, but in other respects like the former.

This rod is to be used for the purpose of putting into action the magnetic power, when the needle has parted with, or lost, any portion of the magnetic power, or becomes variable, or confused in its traverse; and the mode of use is as follows. The needle must be taken out of the compass and laid in a solid position, lengthwise, on a hard plane substance, which substance must be struck with a sharp quick stroke, with the electric rod, close to each side the centre of the needle, which should be held firmly pressed down with the hand. If it be desired to increase the magnetic power, the substance should be struck near to each end of the needle pointed towards the line of direction of the rod; and if the needle be confused, the substance

should be struck near the centre of the needle. This substance may be iron, stone, or firm wood, so that the needle may receive a shock. It is not necessary that the shock should be great, or the stroke heavy, in any case, but it should be graduated according to the defect to be remedied. The stroke should be made with one end of the rod falling flat on the substance to be struck, the hand holding the other end. Immediately after the stroke the needle should be placed on its pivot, when it will take its pole with its former power.

I do not claim any exclusive right as inventor in the form or material of the rod, but only in the application of it in the restoration of the magnetic power of the needle in the manner before described. The electric rod may be applied to the compass needle now in common use, and the caps, or feeders, to any compass needle, the breadth or thickness of each pole being uniform, so as to permit the cap to slide in contact therewith, as before described. When the feeders are slipped near the poles of the needles, this improved needle will show no variation, but take the true meridian any where.

Moses Smith.

Remarks by the Editor.—To examine the pretensions set forth in the foregoing specification would be a mere waste of time, and to pass it over without making any remark upon it might induce some of our readers to suppose that some value was set by us upon the notions of the patentee; whilst, therefore, we shall say but little upon the subject, it yet appears necessary to indicate our opinion.

We have not only read the specification, and examined the drawings which accompany it, but we have seen the proposed compass needles, with their *feeders*, and heard the explanations of the inventor, or discoverer, of this improvement, or rather of these improvements. Notwithstanding all these lights have shone upon us, we are still unilluminated. Men of science know that there exists an intimate connexion between the powers of electricity and of magnetism, and recent discoveries have rendered it highly probable that they are modifications of the same agent; their knowledge respecting them is, however, confined to a few facts, not sufficiently numerous to justify the formation of any theory by which they may be connected together. Whilst those who are acquainted with all the known facts are unable to explain and connect them, it so happens in this, as in similar cases, that there are bold spirits who, although they have acquired but half an idea respecting a single fact, are able by the aid of "the stuff which dreams are made of" to draw inferences, and arrive at conclusions, which are far in advance of those who think it necessary to "render a reason."

To any one acquainted with electricity the absurdity of applying its power by what is above styled the electric rod, will be at once manifest; we are of opinion that the whole is in good keeping in this particular, and that the only advantage resulting from the patent will be to the treasury of the United States.

ENGLISH PATENTS.

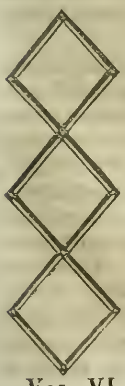
To Robert Lloyd, *Hatter, and* James Rowbotham, *Hat Manufacturer, for a Hat upon a new Construction.* Dated February 19, 1824.

I, the said Robert Lloyd, do hereby declare, that the nature of the said invention, and in what manner the same is to be performed, are particularly described and ascertained in the following description thereof, (that is to say:—)

The plan or construction of Lloyd and Rowbotham's hats, which is entirely new and their own sole invention, and for which they have obtained his majesty's letters patent, is as follows:—

First, this hat is made, or will be made or manufactured, either wholly or by mixtures of hair, wool, silk, cotton, fur, leather, flax, hemp, straw, or any other materials or material not prohibited by law, nor protected by any patent right vested in other persons; they will also be made from silk, or cotton velvet, superfine or other woollen or linen cloths. Second, the peculiar construction of this hat, and wherein it differs from all hitherto manufactured, is, that the crown is made to rise and fall, so as to assume different heights, and the way it is done, is, that one part of the crown is made to retire, fold, or shut within the other, by which operation the middle part of the crown is wholly taken up, retiring within itself, somewhat like a telescope: thus it is, that the same hat may be worn as a high crown or a low crown, and in the latter case the folding or spare part is taken up, so as to be completely out of sight; it is this peculiar way of folding, which is entirely new, that the patentees, Lloyd and Rowbotham, claim as their invention. Third, although the materials with which these hats are or may be made, will generally be put together or manufactured in the usual manner of hat making, there is one way or method which the patentees have adopted, and which they believe never has been done by any other person, viz. instead of making the body of the hat, or the hat altogether in one piece, they have done, and will, for greater facility, cut out two or more flat pieces of felted cloth, woven cloth, woven fur or furs, or any other material or substance, and sew or join them together; in or from which state, the said joined pieces may be strained or blocked to the shape wanted. Fourth, for the purpose of raising and lowering, or folding and supporting the crowns of Lloyd and Rowbotham's new invented hats, they will use the various apparatus herein described and numbered, 1, 2, 3, and 4, viz. No. 1, or diamond jointed prop: this is made of metal, bone, or wood, and (see margin) the centre or extremes of each diamond, by working on a pin or pivot, is capable of being drawn out to any given length, and again shut up or compressed into a smaller compass or space, so

No. 1.



as to allow the crown of the hat to rise and fall, from its greatest to its lesser height. Those diamond joints will be fixed inside the crown of the hat, to prop or support the same, and to each hat will be attached one, two, or more, as may be required; although it is intended, that every prop on this plan shall have three diamond joints, yet a lesser or a greater number may be used; one end of this prop will be fastened to the top of the crown, inside, and the other end at or near the band.

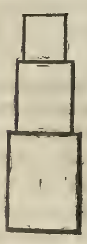
No. 2.

No. 2, or corkscrew joint, is a piece of metal wire, bone, or wood, (see margin,) bent, so that the two ends meet; between those ends is placed a small roller, of metal or hard substance, with teeth, or indented: this roller is placed between the ends of the bent wire by a pin, so that it may work round, and the teeth or indenture act as stops, to keep it in the situation required, the whole acting upon the principle of a corkscrew, to each end of which is fastened a small piece of wire or other hard substance, and may be called arms, one end of which will be attached to the inside of the crown, at the top, and the other end near the band. Of these joints there will be one or more to each hat, and the roller joint will allow the crown to be put up or down as wanted.

No. 3.

No. 3, or hoop, is a hoop of a metal or other hard substance, to which is fixed two or more metal wires, wood, or bone uprights; the hoop to be nearest the top of the crown, and passing through several eyes or loops; and the other ends of the uprights to be fastened near the band of the hat. At each end of those uprights will be a moving joint and swivel, so that each will have two distinct motions with this apparatus, fixed inside the hat; the crown, on being pressed down, forces the hoop to slide partly round through the eyes or loops, until the crown is pressed down to the depth wanted, the uprights falling also, and one over the other; but when the crown is wanted to be raised, the uprights or props assume a perpendicular state, when a small spring hasp in the hoop will keep the crown from falling down.

No. 4.



No. 4, or telescope sliding joint. This joint or prop is made of metal, bone, wood, or any other hard substance, in the following manner: two or several pieces are made with sliding grooves, so that one joint or piece may be pulled out over the other to any given length, and each joint will fasten with a snap, spring, or catch; one, two, or more of these being fixed inside the hat, and fastened to the top and bottom of the crown, will allow it to be compressed and raised as required. There are many other methods by which these hats may be supported and worked up and down, and of which the patentees mean to avail themselves; such, for instance, as a spiral spring or springs; one or more straight pieces of metal, bone, or wood, to

take out and fix in as required, without or with joints or springs, to allow of the crown of the hat being raised or shut down at pleasure or for convenience. The patentees, for the support and folding of these hats, mean also to use two or more pieces of wire, bone, or wood, placed in a transverse direction, so that one-half being made to pass through or turn within the other, will force the crown up and let it down as required, for convenience, or as fancy may direct: in short, this hat is to be folded down and raised in the crown by means of a spring or springs, prop or props, made of bone, wood, steel, iron, brass, or other metal or metals, which are to work or turn on a pivot or pivots, hinge or hinges, sliding groove or grooves, pin or pins, screw or screws, joint or joints.

We are at a loss to discover any utility, or even any thing rational, in this description of a "hat on a new construction:"—if, indeed, among the other variations of fashion, we were condemned to wear our hats a yard or two in length, and to encumber our heads with a few pounds of metal springs, this valuable invention might obtain some repute: it was probably in anticipation of such an event that Messrs. Lloyd and Rowbotham obtained their patent.

We should have refrained from publishing this specification, had we not had several inquiries respecting the nature of the patents obtained by Mr. Lloyd; the former is inserted in our 8th vol. p. 660, present series. [*Rep. Pat. Inven.*

To Henry Robert Salmon Devenoge, *Gentleman, for certain improvements of machinery for Making Bricks. Communicated by a foreigner.* Dated May 8, 1830.

In this machine, two cylinders, coming in intimate contact with each other, are constructed, with a series of cells or moulds for the bricks, of a proper shape, extending around their surfaces. Each cylinder (according to those shown in the drawings of the specification) is represented as being long enough to admit of the moulds of three bricks placed lengthways, and the whole circumference is such as to contain twelve rows, an intermediate space being left between each row alternately, of the size of the width of the bricks; thus, at each revolution of the two cylinders, seventy-two bricks will be made.

The cylinders, which have their axles placed on the same plane, are caused to revolve in reverse directions by means of pinions, that communicate with a shaft or handle, turned by hand or other power, and their relative arrangements are such, that the spaces before-mentioned, between each row of cells on one cylinder, are opposed to the cells themselves on the other. These spaces are directed to be made either of segments of circles, or of any other convenient shape, so as to form similar depressions on the surfaces of the bricks, against which they are necessarily made to press by the revolution

of the cylinders. These depressions or cavities are intended for the reception of the mortar or cement employed in the course of building.

At one extremity of either cylinder, and at a short distance from the axis, a triangular tumbler is placed at the end of each row of moulds, which being acted upon during their rotation by a small wheel or roller, properly stationed for that purpose, and turning horizontally, causes a movement of the lower part of the moulds, and facilitates the discharge of the bricks on to a revolving floor, composed of a series of battens or planks, placed transversely across three endless leather bands, which pass over and again under a like number of rollers, placed at equal distances, to support and extend them. Another small wheel acts in a contrary direction on the tumblers, after the discharge of the bricks, and re-places the moulds in a proper position for the reception of a fresh supply of clay. By these means the use of sand is dispensed with; but in the event of its being deemed more expedient to employ it, a sieve is placed above each cylinder, which will distribute the necessary quantity on the bricks in their passage under them: a hopper is fixed between the two sieves, through which is passed the clay, and the latter is pressed into the moulds by means of a weighted cover, regulated by a lever proceeding from the top. The cylinders are caused to approach or recede from each other when a greater or less pressure is required, by means of screws, properly arranged for that purpose near the axles; and these revolve in suitable bearings. The whole machine is directed to be firmly affixed to standards of iron or other strong material, inserted in a flooring which may be placed on wheels, to render it more portable. [*Ib.*

To SAMUEL WRIGHT, *Gentleman, for a manufacture of Ornamental Tiles, Bricks, and Quarries for Floors, Pavements, and other purposes.* Dated January 26, 1830.

THIS patent consists, first, in the manufacture of tiles, bricks and quarries in various shapes and sizes, from the finer clays and other materials used for working porcelain and earthenware, (instead of from the coarser materials generally employed for that purpose,) and in so combining and firing such clays as to produce a solid semi-vitrified substance, which, it is stated, will be more durable than marble or stone; and secondly, in ornamenting such pavements with various devices and patterns; as coats of arms, crests, patterns of carpets, oil cloths, or Roman tesselated pavements.

To effect the latter, the clay is, in the first instance, impressed with the intended device, by means of a stamp, made of gypsum or plaster of Paris, enclosed in a casing of metal to protect the sides, and by giving it additional strength, to enable a greater pressure to be borne, so that a good and perfect impression will be imparted to the clay. The countersunken impression thus formed, is then filled up with clay, prepared and coloured according to circumstances, with metallic oxides. When the whole is sufficiently dry, it is cut

or ground down to a proper level by a machine that we will now proceed to describe:—

A square cast iron box, having its upper edges made of steel, to prevent its wearing by the friction of the cutting instrument, is furnished with a sliding metal platform, on which the bricks or tiles are to be placed, and this is raised or lowered by the following contrivance:—at each corner of the box is a female screw, in which works a metal pin, having a small cog wheel at its upper extremity; these four cogs are turned simultaneously by a large cog wheel, placed in the centre, and revolving on a vertical shaft, which latter is impelled by a winch, communicating with it by cogs properly arranged for that purpose. By these means the platform can be raised or lowered any distance required, and will remain perfectly stationary until the winch is turned, although in cutting, considerable stress is exerted on its surface by the cutting instrument. The platform, it is observed, should be previously ground quite true and parallel with the steel edges of the box; and the tiles, after being cut, will be found perfectly level, and presenting a smooth and regular surface, leaving the full impression of the pattern. The cutting instrument itself is not described in the specification, nor is the situation denoted in which it is to be placed, but we presume, from the allusion of the patentee to the steel edges of the box, that the blade of the instrument is intended to be in that position. [*Ib.*

To WILLIAM HALE, *Machinist, for a machine or method of Raising or Forcing Water for Propelling Vessels, which machine or method is also applicable to other purposes.* Dated January 12, 1830.

THE patentee states his invention to consist in a vertical or horizontal air-tight paddle box, kept constantly supplied with water, the sides of which (except at an aperture for the escape of the water) being forcibly acted upon by a paddle wheel or propeller, we are told, will propel the vessel to which it may be attached, in a direction contrary to that in which the water is expelled.

The paddle wheel, or propeller, used in this machine, consists of one or more curved paddles attached to spokes, proceeding from an axis, placed eccentrically in a circular paddle box. The paddles vary in size, according to their number and the extent of the discharging aperture, before noticed; that is to say, if one paddle be used its area must be equal to that of the aperture; if two be employed, the area of each must be half the area of the aperture, and in a like ratio for a greater number.

The spokes are fixed at an angle in the centre of the surfaces of the paddles, in order to prevent any vacuum behind; and the distance of the axle from the centre of the box is so regulated, that the paddles in their revolution, come nearly in contact with the side of the box opposed to the discharging aperture; whilst the eccentric space between them and the latter, is equal to twice the distance of the curve of the paddles.

The water to be acted upon, is admitted into the box when placed vertically, by four circular holes made at the side; and when employed horizontally, a supply pipe in the same situation is to be immersed in the water, through the bottom of the vessel. In this instance, the apparatus is directed to be placed about the midships, with the discharging aperture in the direction of the stern; a stout flooring having previously been prepared for its reception. When employed vertically, two paddle boxes are required, as in steam boats in general use, care being taken that the discharging apertures be placed parallel with the keel of the vessel. A modification of the apparatus is also shown in the drawings, in which are two discharging apertures; the size of the paddles being regulated accordingly.

This is a summary description of Mr. Hale's propelling apparatus, as contained in his specification. In what way he intends it to move, or by what means it is to raise water or be employed for other purposes, we presume he considered to be matters of so little importance, that he has left them entirely unnoticed. We leave our readers to define them. [*Ib.*

To WILLIAM STRACHAN, *Manufacturer, for his having invented or found out an improvement in the making or manufacturing Alum.* Enrolled October, 1828.

IT is a well known fact that the alum of commerce has hitherto in this and other countries been principally, if not wholly, manufactured from substances which contain combined naturally two of the constituents of that salt, the sulphuric acid and the alumine. It is also equally well known, that the green sulphate of iron (the copperas of commerce) is manufactured from the decomposable sulphurets of iron, commonly called pyrites, and that this is effected by exposing these sulphurets to the action of the air in a heap, (called by the copperas manufacturers a bed,) by which means a decomposition takes place, which being encouraged by rain and the throwing on of water, a liquid sulphate of iron is produced, which, after evaporation to a certain point, and saturation with iron, is allowed to crystallize, and forms the green sulphate of iron, or copperas. Now my invention or improvement consists in the making available for the manufacture of alum, the sulphate of iron, whether in the state of the raw liquid sulphate of iron, so used hitherto for the making of copperas, or of the crystallized sulphate of iron, or copperas of commerce.

Before I proceed to describe how I effect this, I will for the benefit of those persons, if such there be, who are not acquainted with what is by the copperas makers called a "bed," describe what I consider the best mode of forming one.

The ground on which it is intended to stand should, in the first place, have a low wall built round it, about eighteen inches high. This must be puddled and rammed with such a covering of clay, as

will be sufficient to form a water tight bottom. The bed should have a considerable inclination or slope, in order that the liquor may run from it as quickly as it attains the bottom. The clay should be covered with bricks, flags, tiles, lead, or other substance capable of resisting the action of sulphuric acid, and the top of this last covering being even with the top of the wall, the whole forms a sloping, even surfaced platform. Upon this platform the pyrites are to be piled up or deposited, but I consider it is adviseable before depositing the pyrites, to lay a course of good sized round pebble stones, in order by raising the pyrites from the bottom, to admit air under, and consequently, through the pyrites, by which the decomposition will be greatly expedited, water being from time to time thrown over the pyrites; the liquid sulphate will be given out, and must be received in a cistern or other convenient receptacle at the bottom. The thicker the pyrites are heaped up, of course the stronger will this liquor run from the bed, which bed should, however, be six feet thick at the least. The size or superficial surface of the bed must of course be proportioned to the wants of the manufactory; the shape I do not consider a matter of much moment, though I prefer an oblong parallelogram, the slope falling to one of the longer sides, over the bottom of the "bed," of which shape the liquor will have a shorter distance to run, and consequently the chances of loss be diminished.

I must here state that I do not claim the "bed," or the above method of forming one, as any part of my invention, for the purposes of which the pyrites may be placed in any other plan, manner, or form, as may be considered best and most convenient for effecting their decomposition, the foregoing instructions being only given as a description of what I consider the best mode of exposing the pyrites, for decomposition, and obtaining the greatest quantity of the resulting liquid sulphate of iron. Supposing, therefore, a supply of liquid sulphate of iron, arising from the decomposition of the material pyrites of iron, however placed for the purpose of decomposition. Or if from any circumstances it shall be deemed preferable to use it, the crystallized sulphate of iron, or copperas of commerce to be at hand, I proceed in this order to make the sulphate of iron (in either state) available in the manufacture of alum, I procure a quantity of aluminous clay, or earth, or other substance, containing alumine as white and as free from iron as possible, and also as clear from gravel and other contaminating matter, as is to be had.

I have from experience found the light gray coloured clay shale found among the coal mines, answer the purpose extremely well. Whatever aluminous substance may be used, it is adviseable, by grinding with rollers, pounding, or some other such method, to reduce it to an even degree of fineness; but this is not absolutely necessary, and I practise it only as a means of making lighter the labour. In the next part of the process this aluminous matter I ultimately mix and impregnate with a quantity of the liquid sulphate, arising from the decomposition of the material pyrites of iron, or of the crystallized sulphate, or copperas of commerce, and submit the

mass or matter so impregnated to the action of heat. This may be done in a furnace, kiln, oven, or other convenient contrivance, by putting the aluminous matter therein, and when there, and while under the action of heat, throwing in, or otherwise applying, the liquid sulphate of iron, or other aluminous matter which may first be mixed and impregnated with the liquid sulphate of iron, and then thrown into the furnace, kiln, oven, or other contrivance, and there subjected to the action of heat, until it is thoroughly dried and calcined.

I should observe that when the crystallized sulphate of iron, or copperas of commerce is used, it may be employed either in the state of crystals, or it may first be dissolved in water. If, in the state of crystals, I should recommend a small quantity of water to be thrown upon the mixed clay and crystals when in the furnace, in order to assist the water of crystallization of the copperas, in disseminating the sulphate more evenly through the mass. When the impregnated clay is sufficiently calcined, it will have assumed a pale red colour, and is to be raked or drawn out, and in a cistern, or other convenient receptacle, lixiviated by being covered with water, and from time to time stirred or plunged up. When the water has extracted from the impregnated matter or substance, all its available strength, which it will have done in about three days, it will be formed into a liquid sulphate of alumine, varying in strength in proportion to the strength of the liquid sulphate of iron, and the quantity of it employed to impregnate the aluminous matter, and the quantity of water used to lixiviate the calcined aluminous substance after it has been so impregnated. This liquid sulphate of alumine is now ready to be converted into the alum of commerce, by being combined with the alkali, and treated in the usual mode adopted by the manufacturers of alum, from the materials in common use.

The effect of this process of impregnation, calcination, and lixiviation, is this, the iron being by the heat so far oxidized as to have become insoluble, the sulphuric acid, the other constituent of the sulphate of iron, seizes on the alumine contained in the matter or substance with which it was mixed, and forms the sulphate of alumine which is dissolved, taken up, or rendered liquid, by the water with which the impregnated mass is lixiviated.

Having thus stated the combination of which my invention consists, I shall proceed to describe the apparatus, and method I have adopted for applying those principles to practice; I pass the clay, earth, or other aluminous matter I intend using, through iron rollers, and when sufficiently crushed and prepared, I throw about thirty hundred weight into the furnace.

This consists of a common arched reverberatory oven, about nine feet long by six feet wide, having at one end a fire-place, extending the whole breadth, and separated from the floor on which the matter to be acted upon is placed, by a bridge or midfeather; at the other end is the chimney; in front are three springs with sliding iron doors for charging and discharging the furnace, and stirring the contents during the operation. The fire I keep at a moderate heat, un-

til the clay, earth, or other aluminous matter is dry, when I proceed to throw in the sulphate of iron upon the aluminous matter, stirring the mass up with rakes; this is continued until the whole dose of sulphate (which may be from four to five hundred weight if the crystallized be used, or from one to two hundred gallons, if the liquid) is thrown in, when the fire is urged higher, the raking being continued, adding from time to time water, when the crystallized sulphate is used, until the impregnated clay, earth, or other aluminous matter is quite dry, and so calcined as that the iron which was contained in the sulphate of iron, is so far oxidized as to have become insoluble. When this is effected, which may be known by the mass having assumed a highly reddish colour, it is made to undergo lixiviation; for this purpose, I have a row of stone cisterns about two feet deep, and each of sufficient capacity to contain one charge of the oven or furnace, and as much water as will cover it well; I have also one general receiving cistern, so placed as to receive the liquor from all the extracting cisterns.

The impregnated and contained clay, earth, or other aluminous matter, is, when sufficiently calcined, raked out of the oven or furnace, and put into one of the extracting cisterns and covered with water; after remaining for two or three days, being stirred and plunged up frequently, it is let off into the receiving cistern, and is now ready for evaporation. Instead, however, of immediately running this liquor (which is the liquid sulphate of alumine) into the evaporator, I think it desirable, in case the strength should be less than fifteen per cent. above water, (which will depend upon the strength and quantity of the sulphate of iron used) that the liquor should be returned over freshly impregnated matter, until it has attained that strength.

The boiler I use for evaporation, and which I have found very effective, is an arched chamber, twenty-two feet long, seven feet broad, and three feet deep from the spring of the arch, formed of stone, and arched with brick, having at one end a fire place, extending the whole breadth, separated from the body of the chamber, by a water tight bridge or midfeather. This boiler, chamber, or cistern being filled with the liquid sulphate of alumine, to within a few inches of the top of the bridge or midfeather, the flame or heat radiates down from the arch, and sweeps over the whole surface of the liquor, taking the steam produced with it up the chimney in a continued stream, the evaporator being supplied with fresh liquor as the water is thrown off.

This is the contrivance I use, but of course any other method may be pursued as thought best. During the concentration, the alkali (the other constituent of alum) is to be added. This may be either the muriate of potash, the sulphate of potash, potash itself, or any other salt usually employed by alum makers, though I prefer the first. I consider it best to allow the evaporation to proceed until the liquor is concentrated, to from thirty to thirty-three per cent. above water, before adding the alkali, the proportion of which will be the same as commonly used by alum makers, and must of course

depend on the quality of the alkaline salts employed. When the alkali has been added, the concentration is to be carried on till the liquor has attained the strength of from thirty-five to thirty-eight per cent. above water, it is then to be let or drawn off into coolers, for crystallization; at the end of about ten days, the mothers may be drawn off, when the alum will be found in crystals in the cooler. These crystals are to be washed, re-dissolved in clean water, and again crystallized, and thus repeated.

It is now pure alum and fit for all uses to which alum can be applied, but as alum is generally sold in large masses (the process of forming which is called "rocking") it may for this purpose be again dissolved in a small quantity of water, as will at the greatest degree of heat, which can be communicated to it, take up in solution, and run it into casks or tubs so constructed as to be easily taken to pieces and again set up; in these it should remain from ten to fourteen days, when the mothers may be let off, the casks taken to pieces, and the alum broken or cut up into pieces for sale.

I must here observe, that the clay, earth, or other aluminous substance, which has been impregnated with the liquid, sulphate of iron may, after being lixiviated, serves for the same purpose, for a considerable number of times, varying with the quantity of alumine contained therein, originally, until the whole alumine has been taken up by the successive applications of the sulphate of iron, and also that the mothers of the first and all the subsequent crystallizations may be used over again without limit, I must also observe that all the vessels and apparatus used in the manufacture, must be composed of materials capable of resisting the action of sulphate.

After having fully described the whole course of my mode of manufacturing alum, using for the purpose of such manufacture from the sulphate of iron here, to prevent mistake or misconception, explicitly state and declare of what my invention and improvement consist. I do not claim as my invention the "bed," or the mode of forming one, I have pointed out. Nor do I claim as my invention, any part of the apparatus or process by which the liquid sulphate of alumine is converted into the crystallized alum of commerce; what I do claim as my invention, and an improvement in the manufacture of alum, is the new combination in making available in the manufacture of alum, the sulphate of iron, whether in the state of the liquid sulphate, resulting from the decomposition by exposure to the air and water, however they may be placed for that purpose, of the decomposable sulphurets of iron, commonly called pyrites, or of the crystallized sulphate of iron or copperas of commerce, by producing from the same, combined with clay, earth, or other substance containing alumine, a liquid sulphate of alumine, which being treated with the usual mode adopted by alum makers, may be formed into alum for the purpose of forming this liquid sulphate of alumine; I do not intend to confine myself to the apparatus, or mode of using the apparatus I have before described, or to any other particular apparatus or process, but do for this purpose claim and assert my right to extend to all and every apparatus, by which may be effected the object re-

quired, namely, the mixing or impregnating aluminous clay, earth, or other substance containing alumine with the sulphate of iron, in either state, exposing the clay, earth, or other substance so impregnated, to the action of a heat, sufficient so far to oxidize the iron, as to render it insoluble, and by means of water dissolving, taking up and forming the liquid sulphate of alumine. [*Lond. Journ.*

FRANKLIN INSTITUTE.

Monthly Meeting.

The stated monthly meeting of the Institute was held at their Hall on Thursday evening, August 26, 1830.

Mr. S. V. Merrick, was appointed chairman, and

Mr. F. Fraley, recording secretary pro tem.

The minutes of the last meeting were read and approved.

The following donations were presented to the Institute, viz.

By Mr. Henry Troth.

Accounts of the Corporation of the City of Philadelphia, from December 23, 1816, *to January* 1, 1828.

Statement of the Expenditures of the City Commissioners for the years 1817 *to* 1829, *inclusive.*

Reports of the Watering Committee to the Select and Common Councils, from Nov. 1, 1802, *to Dec.* 31, 1829.

By Isaac Hays, M. D.

Leçons de Chemie Appliqué a la Teinture faites à la Manufacture Royale des Gobelins.

By Mr. W. P. Farrand.

Mr. Everett's Address on the Second Centennial Anniversary of the arrival of Gov. Winthrop at Charlestown.

By James J. Barclay, Esq.

The Second Annual Report of the House of Refuge.

By Mr. S. C. Atkinson.

The Casket, from January to August, 1830, *inclusive.*

The corresponding secretary laid on the table the following works, received in exchange for the Journal of the Institute, viz.

Recueil Industriel, for March and April, 1830.

Bibliothéque Physico-economique, for May and June, 1830.

Journal Universel des Sciences Médicales, for February and April.

Annales de Chimie et de Physique, for February and March.

Bulletin de la Société d'Encouragement pour l'Industrie Nationale, for January, February, and March.

London Journal of Arts and Sciences, for June, 1830.

The Repertory of Patent Inventions, for June.

Gill's Technological and Microscopic Repository, for June.

Boston Mechanics' Magazine, for July and August.

New York Monthly Magazine, for July.

Southern Agriculturist, for August.

The Southern Review, from February, 1828, to the present time.

The committee appointed to engross the rules and regulations of the reading room, and to report rules for the government of that class of the library intended for circulation, presented a report which was read, and ordered to lie on the table until the next monthly meeting.

S. V. Merrick, *Chairman.*

F. Fraley, *Recording Secretary pro tem.*

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Observations on Wooden, or Frame Bridges. *By* Col. S. H. Long.

The subject of trestle, or frame work, and wooden viaducts as substitutes for high embankments and stone bridges, has been much agitated in different parts of the country, and especially among those interested in the Baltimore and Ohio Rail-road. Doubts have arisen in the minds of many as to the propriety of adopting wooden structures instead of their more substantial rivals of stone in connexion with rail-roads, under any circumstances. These doubts have had their origin in the numerous examples of unsteady, flexible, and unsubstantial frame bridges, which are to be met with in almost every part of the country. The impression uniformly entertained, that a structure for the support of a rail-way, must be firm and unyielding, is no doubt correct, and well founded: while the impracticability of giving to a structure of frame work the character just mentioned, by the ordinary modes of construction hitherto adopted for wooden bridges, &c. is equally obvious and certain.

The defects observable in structures designed for the purposes above intimated, and especially in those intended for the support of rail-ways, as also the injurious consequences to which they give rise are briefly as follows, viz.

1st. The extent of the base or foundation on which the trestles rest is often much less than is necessary to insure firmness and stability to the superstructure, which is, in consequence rendered far more liable to derangement from the shocks and strains to which it is unavoidably exposed. The length of the trestle sill, transversely of the road, or longitudinally of its foundation, should be at least equal to two-thirds the height of the structure.

2nd. The mode of bracing the trestle or frame pier is often defective and inefficient. The braces are frequently arranged in such a manner that the thrust or resistance communicated by them is met by no other counteraction than that imparted by the stiffness or inflexibility of the beam or post with which they are connected. This must be regarded as a defect totally incompatible with firmness of structure, and should be studiously avoided. The remedy is simple and obvious, and is at once suggested by a recurrence to the principle denominated the "parallelogram of forces." The brace is represented by the diagonal, the posts by the ends, and the sill and beam by the sides of the parallelogram. The action of the brace, whether by thrust or tension, should be communicated to the sides

and ends of the parallelogram in such a manner as to resolve itself into, or be counteracted by two forces acting at right angles to each other, and at the same point. A wooden brace should generally act by thrust, consequently the post, and beam, or stile, that receives its action should act by tension. From the principles here adverted to, it may be inferred that stiffness can only be insured in a braced trestle by braces and counter braces, the heads and feet of which are firmly connected by ties, also that a trestle cannot be rendered firm and unyielding when the braces meet the posts, beam, or sill, at points unconnected by ties in the manner just explained.

3d. The spaces or spans between the trestles are generally greater than is compatible with the requisite stiffness in the rail timbers. It is believed that the points of support for wooden rails should never be more than ten feet asunder even when the rails are 14 inches deep. The object of thus limiting the span is to prevent any perceptible yielding, or even trembling of the rails during the passage of the heaviest loads. Any want of efficiency in this respect will obviously be attended not only with a loss of motive power, but with an increasing liability to derangement in the joint and other parts of the structure.

In case a greater span should be necessary, the enlargement should be effected in a manner that has never hitherto been adopted, so far as we have a knowledge of the subject. A system of framing analogous to that exemplified in the Jackson Bridge, hereafter to be more particularly noticed, may be advantageously adopted in the following manner. Let the span be 24 feet, divide this distance into three equal parts, and from the two points of division intermediate to the span, let braces pass downwards at a suitable obliquity to the trestles. Connect the trestles by one or more string pieces, or ties, attached to them at the points where the feet of the braces are inserted. The thrust of the braces downward will by this means be resolved into horizontal and vertical action in the direction of the trestle post, and any yielding of the parts of the structure situated between the trestles will be effectually prevented.

If it be required to extend the span through a distance of 40, 50, or 60 feet, the system just adverted to is susceptible of a modification adapted to such an extension by simply introducing the posts, main, counter, and lateral braces as contemplated in the plan of the bridge above mentioned. By this means an unyielding support will be afforded to every part of the structure.

4th. As a means of conducting rail-ways across deep vallies, rivers, &c. bridges of a span much greater than those above mentioned are frequently required. In these, firmness and stiffness are no less requisite than in the smaller structures above considered.

The systems of bridge building most extensively adopted in the United States are those devised by Wernwag, Burr, and Towne; the two former involving the principle of the arch, as a means of support; and the latter a sort of lattice truss work of timber, in which a system of bracing and counter bracing, which may be re-

garded as essential to stiffness in a bridge of any considerable length, is displayed and applied to much advantage.

With respect to the wooden arch, as a means of support, it may be affirmed with truth that however well its adjustments, it is not susceptible of any arrangement, by which a load upon one of its quarters (or between its crown and either abutment) will have a tendency to depress the opposite quarter; or by which a load at the centre of the bridge, will not have a tendency to thrust outward, both quarters. Hence, from the nature of arched structures of wood, the actions are neither equal nor uniformly in the same direction, and cannot be effectually counter united in such a manner as to prevent a vibratory movement, as the result of any change in the position of a load sustained upon the arch.

With respect to Towne's bridge, its mode of construction is such as to ensure the requisite stiffness, so long as the trenails, by means of which the braces are confined to each other and to the strings of the bridge, remain unimpaired, and the holes in which they are inserted, unenlarged. The great strain, however, to which these parts are unavoidably subjected, and their inability to resist, without injury, the storms and shocks to which they are exposed from the rapid passage of heavy loads upon the bridge, render fixtures of this description very objectionable, and quite incompatible with stability and permanency of structure.

The plan upon which the Jackson Bridge is constructed, is without doubt better calculated to insure the objects last mentioned, than that of any other bridge we have ever seen. In this a system of bracing and counter bracing has been introduced, by means of which a load resting upon any part of the bridge between its supports communicates a downward thrust, to all parts included within the same span. Like Towne's plan, it is dependant on its braces, exclusively, for its support and stiffness. But the thrust of its braces is received upon steps or shoulders in the posts, furnished with thin plates of sheet iron, or even tin, by which a metallic bearing is given to the parts exposed to the greatest strain, instead of trenails, as in the plan just before considered.

The system embraced in the Jackson Bridge is such, that the braces all act uniformly in the direction of their axes, and exclusively by *thrust*. Their connexion with the truss frames is such as to preclude any action by *tension*. Moreover the adjustment of the counter braces provided for in this work of construction is attended by a peculiarity, of which bridge architecture has never before furnished an example. The peculiarity alluded to, is, that the counter braces, by means of wedges or keys at their heads, are made to perform the office of forcing downward, or loading the bridge in such a manner that the strain to which it is subjected by the passage of the heaviest load, is no greater than that exerted upon it without a load. By this means the elasticity of the truss frames is so effectually counteracted, that every appearance of yielding is entirely excluded from them.

A structure possessing these properties cannot fail to recommend

itself to the consideration of those who may be interested in the adoption of the most firm and substantial mode of constructing bridges. Nor is the simplicity and economy displayed in the construction of the Jackson Bridge less conspicuous than its firmness and efficiency.

For a more particular account of this bridge, see the Journal of the Franklin Institute, for April, 1830.

On the comparative expense of covering the Roofs of Houses with different materials. Abstracted from an Essay on Architecture in the United States, published in Silliman's Journal, vol. 18, *page* 234.

There is one practice among us most destructive to property, and yet strangely suffered to exist almost without comment. I refer to roofing with pine and oak shingles. The frequency and extent of fires in our cities are proverbial: their extension is caused, in nine cases out of ten, by our wooden roofs. We feel their dangerous character, for in case of fire, our first attention is always directed to the roofs of the neighbouring houses; here our apprehensions fix themselves most keenly, and on them the engines most unremittingly play. "If the roof can be saved," is the universal cry, "all is safe." Is it not most strange, then, that people will still continue the practice of roofing with such combustible materials, or that if they will do so, the state authorities do not interfere and put a stop at once to the evil? The practice, so dangerous, often so widely destructive, cannot even plead economy in its support. I have received from an eminent architect in New York, some very valuable memoranda, showing the comparative expense of various kinds of roofing in that city, which will furnish us with some useful data: I regret that our limits will not allow me to lay the whole before the reader.

The following will show the present prices of roofing in that city, and the time each kind will last.

	Prices.	Time which they will last on a roof inclined 26° 30′
20 In. white pine shingles, in three thicknesses, laid on white pine boards, with square edges, per 100 superficial feet,	from \$7 to 9*	from 20 to 25 years.
30 In. white cedar shingles, in three thicknesses laid on oak laths, the laths 1 inch by 2 1-4 inches,	" \$10 to 12	" 35 to 40 "
16 In. Welsh slate, laid on 1 1-4 inch plank, with square edges, close and leaded at the ridge,	" \$12 to 14	" 35 to 40 "
16 In. Welsh slate, laid on oak laths, and plastered between the laths with lime and sand mortar, and leaded,	" \$14 to 16	" 40 to 45 "

* These prices include the expense of boarding, lathing and plastering.

Tile laid on oak laths 1¼ inch square, and pointed on the under side between the laths, with lime and sand mortar,	" $12 to 15	" 60 to 70 "
Common bright tin, with grooved edges, laid on 1½ inch white pine plank, ploughed and grooved, the grooves of the tin first put together with white lead and well beat down,	" $18 to 20	" 25 to 30 "
16 Oz. sheet copper, (or one pound to the square foot,) with grooved edges laid on 1½ inch pine plank, grooved as above,	" $35 to 40	" 55 to 60 "

From this it appears that Welsh slate, even when imported, is in the end, exactly as cheap as pine shingles, while the expense of tiling is only about half as great. Slate has been found in our own country, and extensively wrought, but its quality I believe is not equal to our severe winters, and the Welsh slate is still preferred. But we know not yet half the resources of our country, and if encouragement were given, slate of as good a quality as any from abroad, would probably be found. A correspondent in Baltimore informs me that a company has been formed in that city, which has undertaken to supply the inhabitants with slate, at as cheap a price as that of shingles. Doubtless the price of slate may be greatly reduced, should its use be encouraged, and the subject is one worthy of immediate attention among our civil authorities. In Boston, I understand a law exists, that no house above a certain height shall be covered with shingles: there may be such laws in other of our cities, but I have not heard of them. There is none in Baltimore, nor any ordinance encouraging the use of slate. In that city about 30 per cent. of the houses are covered with slate or tiles, and about a dozen with copper or tin. In New York the number of slate roofs is about one-half of the whole. Tiles were much used in the latter city, about forty or fifty years since, but are now seldom employed, chiefly on account of their weight and clumsy appearance. They might be made a very cheap article. In the south of Europe, and in Turkey, they are universally employed, and in one of these cities where I gave the subject some attention, a sufficient number may be procured to cover one hundred square feet, for one dollar and thirteen cents. Their appearance will probably prevent their use to any great extent in our cities: any thing, however, is better than pine shingles. The destruction of property which they cause among us is immense. It is impossible to estimate the whole amount, but some idea may perhaps be formed of it, from the fact, that the aggregate amount of loss paid by the insurance companies of New York for the last four years, as reported to the legislature in February, was 2,085,000 dollars.

Remarks by the Editor.—To the general correctness of the foregoing observations on the security derived from incombustible roofing but few will object, yet we do not admit its universal truth. As respects security from fire, such a roof defends a building from the danger of its being communicated from without, through the roof; which, in situations where the supply of water and the means of ap-

plying it, are not ample, is frequently the most imminent; but this does not apply to the city of Philadelphia, and we fearlessly assert that in that city a house with a shingled roof is more secure than one with a covering of metallic or earthy materials. There, the instances of the communication of fire from one house to another by the roof, are very rare; the supply of water is so abundant, the hose and engines are so numerous, and the fire companies so well organized, that the roofs of houses adjoining those on fire, are immediately deluged with water, and combustion rendered impossible.

We have witnessed there several proofs of the injurious effect of incombustible coverings on buildings in which fire has originated, and will mention two. The house of Mr. Samuel Richards was covered with sheet iron; a fire commenced in the upper part of it, which would have soon made an opening in a roof of shingles, through which the water would have been admitted to the fire, but being confined by the iron, the destruction produced by it was greatly increased. The printing office of Mr. Jesper Harding was roofed with slate; at the time it was burnt, the loft was occupied as a bindery, and a large portion of the building and of the property contained in it would have been preserved but for the slating.

We are not acquainted with any other city, to which this exception would apply, as we do not know of one in which the means of extinguishing fires bear any comparison with those provided there; the value, therefore, of the information contained in the foregoing extract will not be lessened by any thing which we have said.

On the manufacture of Red, Green, Yellow, and other Enamel Colours.

[Translated from the *Dictionnaire Technologique*, for the Technological Repository.]

Red.—This is a primitive colour, that is to say, it is not formed by a mixture of other colours; it is generally obtained from iron. There are plenty of processes for making it; some consist in calcining the sulphate of iron, others in oxidizing native iron, by the aid of a strong heat and the contact of the atmospheric air. But the following is the manner of procuring the most beautiful red.

We must procure a quantity of steel, the best and finest which can possibly be had; the old blades of English razors are very good for this purpose. These must be broken into small pieces, and be introduced into a matrass containing sulphuric acid diluted with water. The solution may be made in the cold, but much better and quicker by the aid of heat. When it is effected, the solution must be poured into a porcelain basin, and be evaporated on a sand bath, until the liquid has attained a certain degree of concentration; it must then be exposed to the open air, when crystals of sulphate of iron will be formed. When these have attained a proper size, they must be taken out of the mother waters, and be placed upon a leaf of paper to be washed.

After the sulphate has been well purified, it must be dissolved in

about three times its weight of distilled water, be filtered through paper, and evaporated a second time. It will then form, on cooling, crystals of the sulphate of a beautiful emerald green colour, and very transparent. After these have also been well washed and dried, they must be enclosed in a wide mouthed bottle, with a ground stopple to it.

When we would prepare the red colour, we take one part by weight of the sulphate, and a quarter of a part of sulphate of alumine (alum,) and grossly powder them, in order the better to mix the two salts; on the other hand, we make a charcoal fire in a calcining furnace, and when it is of a good glowing heat, we place a plate of thin sheet iron upon the coals, on which we have previously laid the two powdered sulphates. The aqueous fusion of the two salts takes place at the same time, but the mixture is at first white, and then reddens: we should, therefore, take great care not to make the fire too strong, lest we cause this red tint to fade. Finally, when we perceive that the colour is uniform throughout, we remove the plate from off the burning coals, and leave it to cool, and we may distinctly perceive that the more it approaches to the temperature of the atmosphere, the finer the red colour is developed.

Nevertheless, as we may always find in the calcined mass, certain parts of the oxide of iron where the red is of a more agreeable tint than in other parts, so we may select them. We deposit these selected pieces upon a glass slab, moisten them with distilled water, and grind them with a glass mullar until we have reduced them to a very fine powder. When this is effected, we remove the colour with a palette-knife, and place it in a porcelain vessel, when we wash it repeatedly with hot water, decanting the water each time; finally, we dry the residuum in a gentle heat.

In order to make known the reason for adding a fourth part of the sulphate of alumine to one part of the sulphate of iron, we must say that it is not because the colour becomes thereby finer and more intense; on the contrary, the alumine, by the white tint natural to it, tends to deaden the clear red which the iron manifests; but as that colour is extremely fugacious, the alumine by its refractory property, gives it a certain fixity which it would not otherwise possess; so that although this last substance predominates in the composition, yet the red colour is more fixed, although less intense. But we must not proceed beyond the due limits in this respect.

This red is greatly employed in vitrificable painting; it is used in imitating many flowers and fruits: it also forms entire draperies; it likewise enters into the tints destined to imitate the carnation, such as in certain parts of the lips, the corners of the eyes, &c.

The alkaline fluxes are not proper to be mixed with this red colour; the metallic fluxes are much better. This colour is one of those which spread readily under the pencil, and as it receives a large quantity of flux, so it is greatly used upon glass, enamel, and porcelain.

Of flesh coloured enamel.—This colour, whose name is sufficient to demonstrate that it is very useful in this kind of painting, is also

made with the sulphate of iron; but instead of only using one-fourth of a part of the sulphate of alumine, as in the case of making the red colour, we mix two, three, and even sometimes four parts of it; so that, as we know that the alumine is a white substance, the red becomes paler accordingly in notable proportions, and we thus obtain what are termed *flesh colours.* We here also perceive, that in virtue of the refractory quality of the alumine, we are obliged to introduce in the flesh colours a greater quantity of the above mentioned fluxes; nevertheless experience has pointed out in a peremptory manner the theory for the best mixtures.

Green coloured enamels.—These colours may be obtained from two metals, copper and chrome. The following is the manner of procuring it from the first of these metals.

We choose the finest rose copper which can be had, make it very thin, and cut it into small bits, which we dissolve in two or three times their weight of nitric acid, diluted with water. We must take care to introduce the metal a little at a time, in order to prevent a too great effervescence taking place, and lest we should risk the sudden loss of the oxigen in the acid. We add the metal as we see the action is terminated, and thus continue until a perfect saturation is obtained; finally, we place a crucible in a wind furnace, and heat the crucible by placing burning charcoal around it; we then pour into it about a fourth part of the contents of the solution of copper. When the liquid receives the impression of the fire, it swells and mounts towards the upper part of the crucible. If it threatens to escape, we must direct the wind from a pair of hand bellows into the midst of it. This precaution hinders the loss of the liquid, and it instantly falls to the bottom of the crucible.

When the evaporation of the quantity first poured in is completed, we add another portion of the solution, always taking care to put in but a little at a time, for the reason above assigned. We thus continue the process until the whole quantity is poured in, when we cover the crucible, and carry the calcination to a red heat. At the end of a quarter of an hour's firing, we take out the crucible, and let it cool. When we take it in the hand, with a steel knife, whose point is a little rounded, we remove the oxide of copper, which appears in the form of a very black powder, and in a state of extreme division, unless the fire has been too violent, in which case the oxide will be of a gray colour, and its molecules become agglutinated, and attached to the interior of the crucible, so as to make it difficult to remove them. This circumstance is an inconvenience which it is better to avoid by employing a moderate fire.

Potash and soda also precipitate copper from the nitric solution of it; but then the precipitate is of a bluish green colour: by calcination it becomes black. We may employ either of these two processes, but must observe that the first is that constantly used.

The oxide of copper affords a fine green colour when it is vitrified with fluxes; but it is a little difficult to use with the pencil. Nevertheless this colour is indispensable, it furnishes those tints which

are peculiar to it, and which the oxide of chrome, of which we shall next speak, is incapable of affording.

Another green colour produced by the oxide of chrome.—This oxide is obtained by the decomposition of a stone, which is named chromate of iron. This stone is of a bluish gray colour, and often black. The following is the manner of treating it, in order to procure the green oxide of chrome.

We pulverize the stone in an iron mortar, and pass the powder through a very fine sieve; it is then mixed with a little less than its own weight of the nitrate of potash, also pulverized. The mixture being intimately made, we fill a Hessian crucible two-thirds with it, and place it in a wind furnace; we then cover the crucible, and heat it. We should observe that we must take care to apply the fire by degrees. As the matter begins to become red hot, we perceive a movement to take place throughout the whole mass; the nitrate of potash is decomposed, and there escapes from the mixture, between the cover and the upper edges of the crucible, a great quantity of azote, in the gaseous state. The residuum in the crucible consists of the chromate of potash, alumine, silex, and the oxide of iron.

The operation may last from half an hour to three-quarters of an hour, with a continued fire: at the end of this time the crucible is withdrawn from the furnace, and left to cool; it is then broken, and its contents pulverized. This powder is then mixed with four or five times its weight of water, in a copper vessel, and placed upon the fire. After boiling for a quarter of an hour, the water is decanted, which will have assumed a fine golden yellow colour. We filter this water through paper, and again put it into the copper vessel, in order to cause it to dissolve what little chromate of potash may still remain in it; we filter this as before, and repeat the process until the water is no longer coloured yellow.

On the other hand, we dissolve in the nitric acid a certain quantity of mercury: when the solution is effected, we pour the nitrate of mercury into the solution of chromate of potash, when there will fall a precipitate of a red colour, which is more or less lively, according to the degree of purity of the two solutions; we decant the supernatant water, which ought to be limpid and colourless, instead of yellow, as it at first appeared. We then wash the red deposit which is found at the bottom of the vessel: this is the chromate of mercury.

We proceed as follows, in order to procure the oxide of chrome, which we extract from the chromate of mercury with which it is mixed. We put the chromate, whether dry or not, into a crucible, place it in a furnace, and urge the fire. By this operation the mercury, by reason of its volatility, escapes from the composition, so that at the end of a quarter of an hour, there only remains the oxide of chrome in the crucible, in the form of a light powder, very much divided, and of a fine green colour.

If you would avoid the loss of the mercury in this operation, you must place the chromate of mercury in an earthen retort, to the

beak of which an adopter must be luted, with its recipient, in order to condense the mercurial vapours.

If you would not obtain the green oxide of chrome by the distillation of the mercury, you may procure it directly by mixing the chromate of potash with double its weight of flour of sulphur, and subliming it over the fire. In this operation the sulphurets and the sulphites of potash are formed, which may be dissolved out by hot water, and the oxide of chrome be set at liberty. In this last manner the green colour may be extracted from the chromate of iron; and we believe the process is performed by many persons.

This oxide of chrome is very fixed; it bears the great heat of a porcelain furnace without being neutralized; and it can thus be successfully employed to make the plain foundations of the vases intended to be decorated with gold. The tints of green may be varied at pleasure, either by the addition of a little blue, or a little yellow. These colours are but rarely vitrified before using them, which renders them exceedingly easy to spread with the pencil.

Of yellow coloured enamel.—This is also a primitive colour, and is procured from several metals, such as antimony, lead, tin, and also silver. The following is the mode of procuring the oxide of antimony, which serves as the basis of a yellow colour of different tints.

They reduce the regulus of this metal to a very fine powder, and pass it through a sieve; they also pulverize the crystallized nitrate of potash (or the nitre of commerce;) they then take one part of the regulus of antimony, and one part and a half of nitrate of potash, and mix the two ingredients intimately; they then place a crucible, formed of good clay, in a furnace, with a good draught, and project into it, a little at a time, the mixture of antimony and nitre. At each spoonful of the matter introduced into the crucible, there is a considerable movement of the mass exhibited; this motion is accompanied by a vivid and brilliant flame; this is extinguished by adding a new quantity of the matters; and the process is continued until the crucible is become nearly full, when it is covered, and a brisk fire is kept up for a quarter of an hour. At the end of this time the crucible is withdrawn from the furnace, broken, and the heavy mass which adheres to it detached; this is pulverized, ground with water on a glass slab, and then placed in a porcelain vessel, where hot water is poured upon it many times. Thus the excess of potash is washed out, and the white oxide of antimony remains at the bottom of the vessel; this is termed washed diaphoretic antimony.

When we would fix this yellow colour by fire, we combine, with one part of this oxide of antimony, one or two parts of the red oxide of lead, or minium, and mix the two oxides perfectly; we then place them in a crucible, and introduce it into a laboratory furnace; we give it a slight degree of fire, but continue it for three-quarters of an hour, after which we withdraw the crucible, break it, and find the mixture converted into a fine rich yellow colour.

We can easily, by the same means, obtain yellows, more or less coloured; it is sufficient to know, that for this end, the more the oxide of lead predominates, the paler will the colour of the yellow be.

We can also prepare a very beautiful yellow colour by mixing in a similar manner, with one part of the white oxide of antimony, a part and a half of the acetate of lead (white lead,) and one part of the hydrochlorate of ammonia. We pulverize these substances, sift them, and put them upon a test, which we place in a calcining furnace, and make a fire sufficiently intense to decompose and sublime the hydrochlorate of ammonia. When we perceive that the operation is terminated, which is manifested when not an atom of smoke rises; and the composition also appearing of a yellow colour, we withdraw it from the fire, leave it to cool, and wash it in a large quantity of water.

We can also form another yellow with two parts of the white oxide of tin, one part of minium, one part of the sulphate of alumine, and half a part of the hydrochlorate of silver, which the older chemists termed *lunacornea.*

[TO BE CONTINUED.]

On an Improved mode of making Plaster of Paris.

[Translated from the *Dictionnaire Technologique,* for the Technological Repository.]

This plastic material is obtained by calcining and reducing to powder the native sulphate of lime, or gypsum. The sulphate of lime is known under the name of plaster stone, and is found, in general, on the upper parts of the secondary formations, but sometimes on the tertiary ones. In the first, it forms thick couches interposed with calcareous beds; in the second, it forms deposits, more or less extended, and accompanied by clay or marle: it is thus found in the neighbourhood of Paris, where it forms a considerable object of commerce; the department of the Seine alone consumes about five millions of hectolitres. It is also sent to many of the neighbouring departments, and is even exported to England.

The mode of procuring the native sulphate of lime, is either by forming pits or galleries, as in other quarries. We remark, in quarrying the plaster stone, three principal varieties, the one in crystals, agglomerated into irregular masses; of this great quantities are got, containing about twelve per cent. of carbonate of lime; this is the stone which is commonly employed in making plaster to be used in buildings, and for improving the quality of soils. The second kind, formed of lamellar sulphate of lime, crystallized and nearly pure, is found in tables, bisected at their bases, by oblique angled parallelograms; it is also met with in the forms of prisms and lentils, more or less large, isolated in groups or rosettes, and also in the form of the heads of lances; it is yellow, and as clear as water. It is used for the making of the finest plaster, which is employed for making moulds and casts, and in stucco. The third variety, used in the arts, is found in homogeneous masses, semi-transparent, white, but containing yellow zones: it is capable of acquiring a greater degree of hardness, by a slight baking, and of receiving different tints. This substance, which is known by the name of alabaster, is made into

vases, and various other ornamental objects; but it must not be confounded with the alabaster of the ancients, which was a crystallized carbonate of lime, of a yellow colour, veined, and capable of receiving a high polish.

We also find in nature a kind of anhydrous sulphate of lime, but as it is not capable of becoming solidified with water, so it is not employed. A bluish silicious variety, which is found in Italy, is employed in making chimney pieces, pavements, &c.

It is the crude sulphate of lime, which, disseminated in great abundance in the soil of Paris, and the surrounding heights, communicates to the water in the wells of this city, that selenitic quality, which renders it improper for the purposes of washing and boiling vegetables. We may, indeed, in part, remedy this inconvenience by decomposing the sulphate of lime, with which it is nearly saturated, by the sub-carbonate of soda, which precipitates the lime in the state of a carbonate: it will require nearly 250 grammes of the sub-carbonate of soda for 100 litres of water, admitting that this contains the three hundredth part of its weight of sulphate of lime.

On baking the plaster.—They use for baking the plaster, many sorts of furnaces; but that which is most commonly employed consists of a rectangular building of from eight to ten feet square, and about nine feet in height, formed of three walls, built either of bricks, or rough stones, of from sixteen to eighteen inches in thickness, terminated by a vaulted arch, and covered by a roof, at the distance of two feet.

They construct, across the mouth, or open front of this building, with plaster stone, several parallel rows of vaults, employing for this use the best shaped stones; they then cover these vaults with more plaster stone, first using the larger pieces, then smaller ones, and, finally, covering the whole, near to the vault, with the smallest pieces, and the dust formed in breaking the plaster stone. They then place, underneath the vaults formed in the plaster stone, either some bavins of dry wood, or billets, or faggots, according to the locality. The flames penetrate through the vaults, and the stones which surmount them; but they finally escape through flues made in the wall opposite to the front of the furnace, near the chimney.

Lime kilns, where the calcination may be continued without intermission, without employing wood, but pit coal, may also be used, in various localities, for baking plaster.

Whatever may be the mode of constructing the furnace adapted for this operation, we may remark great variations in the quality of the plaster obtained; in fact, those parts of the stone which are nearest to the fire, in consequence of the temperature being too great, begin to undergo an igneous fusion, which renders the plaster incapable of imbibing water, like the native anhydrous sulphate of lime. Also, in the middle of the same stones, and especially in the centre of those which are the farthest removed from the fire, we always meet with a nucleus, more or less great, of crude, and, consequently, inert plaster. We may readily conceive that a mixture of the parts which are too much calcined, with others that are too little baked,

in different proportions, must yield a product of a greatly variable quality. It, indeed, sometimes happens that the whole quantity in a furnace is either too much or too little baked, and thus furnishes a plaster unfit for use, and which the builders refuse to employ, and with reason. In this case, the purchaser is generally obliged to mix the bad plaster, in various proportions, with that of a better quality.

We may readily conceive that from these causes we most generally obtain plaster of an inferior quality. I have occupied myself in searching for the means of constantly producing plaster of the greatest degree of hardness, and have to remark,

First. It has hitherto been thought that it was the lime, in certain varieties of the plaster, which augmented its hardening quality, when mixed with water. But, in fact, the temperature most fit for calcining it, appears from my experiments, to be much lower than that usually employed in the decomposition of carbonate of lime; and if this latter substance concurs in ameliorating the quality of the plaster, in some of the processes in use, it is probable, that from its interposition, it facilitates the transmission of the heat, and hinders in part the ill effects of calcination at too high a temperature; and it appears that the granular carbonate is harder than plaster, as used in various mortars.

Secondly. In various parts of the ordinary furnaces, the calcination, being unequal, produces great differences in the useful properties of the plaster obtained, and nearly all the kinds produced are defective, either from the excess or defect of the temperature.

Thirdly. In fact, the interior parts of the calcined stones contain crystals, either not altered, or incompletely deprived of their water of crystallization, and are thus deprived of the properties we seek for in this plastic material.

These preliminary remarks lead me to suppose that the degree of temperature fit for the baking of plaster, is considerably less elevated than that generally employed, and indeed I was not long in ascertaining the fact, by the following experiment.

I reduced into coarse powder some of the plaster stone, from Montmartre, and exposed it on the outside of a tube, to the heat of a continued current of high pressure steam, at 105 degrees, as it passed through the tube. At the end of six hours, I ground this powder fine, and knew, upon mixing it with water, that it had acquired the property of solidifying with greater energy than plaster of the same sort, baked in a furnace in the usual manner. Wishing to know the limit of temperature at which the native sulphate of lime in powder lost its water of crystallization, I tried successively the effects of still lower temperatures, and found that at 80 degrees of the centigrade thermometer, the plaster obtained solidified with water, whilst the fragments of impure plaster, in small lumps, were not sufficiently calcined at 95 degrees; and, in fine, that the regular crystals of sulphate of lime, exposed to the same temperature, were only partially desiccated; the effect not penetrating to any great depth.

These facts permit me to hope, that we may now be able to treat

plaster stone, in the large way, with regularity, and thus constantly obtain this plastic material of the best quality. In fact, as the whole question of baking the plaster is now reduced to a simple desiccation, easily effected by steam, so all the difficulties hitherto experienced, from the bad construction of the furnaces, whether heated by wood, pit coal, or turf, may be made to disappear.

We can also thus usefully employ the enormous quantities of plaster stone in powder, which now encumbers the quarries; as it would be proper, henceforth, either to crush the stone into small fragments, or, still better, to grind it to a coarse powder in mills, before baking it. This first labour would not be lost, as the baked plaster might be sifted, and directly employed without being subjected to pounding or beating, an expensive operation, and which always causes the loss of a great quantity of the material.

A perfect regularity in heating the plaster stone may be attained by means of steam; using an inclined plane, formed of cast iron tubes, flattened at top, and communicating with each other at their ends. This steam tube is to be connected with an ordinary high pressure steam boiler, and so disposed that the condensed water may return again into the boiler. A manometer (or steam gauge) must be placed on one of the tubes to indicate the pressure of the steam, and to regulate the temperature accordingly. A pipe with a stop cock must be placed on one of the most elevated parts of the tubes, in order to permit that air to escape which might oppose the constant communication of the steam. We could also employ a set of cast iron plates, which might be covered with plaster stone to be baked upon the steam tubes, and be removed when that operation has been performed, and replaced by others in constant succession.

Whatever has been the mode of baking adopted, we must carefully prevent the plaster from being exposed for a long time to the air, and especially when it is moist, as it would absorb the water again by degrees, and thus become incapable of hardening when we would employ it, and, in fact, will have become an inert powder.

To use this plaster, we have only to add to the powder a sufficient quantity of water, when it will directly assume the consistence of ordinary mortar, and must be mixed up with a trowel.

The fine plaster, mixed with a solution of glue, and having afterwards various hard and coloured substances incorporated with it, forms the basis of one of the processes employed in the making of stucco, to imitate marble. Plaster is also employed in buildings, and in moulding objects of sculpture: it serves to decompose the ammonia, in the manufacture of sal ammoniac, and great use is made of gypsum in agriculture. P.

[*Tech. Rep.*

On Polishing Metals.

[From the *Dictionnaire Technologique.*]

Before proceeding to polish metals, they commence by preparing the surfaces they would polish; that is to say, it is of importance to

remove all the marks left by the file, the turning tool, the scraper, &c. in order to render the surfaces uniform.

This preparation is effected on those metals which are not very hard, by means of pumice stone, either used in substance or reduced to powder, and water; when in powder, it is applied upon felt, or upon slips of soft wood, covered with buffalo or chamois skin, if the surfaces be flat; or with pieces of soft wood, properly shaped, so as to penetrate into the hollows, and act upon the raised parts.

When the first coarse marks are thus removed, they then proceed to remove those left by the pumice stone. In order to this, they employ finely powdered pumice stone, which they grind up with olive oil, and employ it upon felt, or upon small pieces of soft wood, such as that of the willow or sallow. It is necessary, in these manipulations, to observe an important rule, which is never to proceed from one operation to another, before previously washing the pieces of work well with soap and water, by means of a brush, in order to remove the pumice stone; using water entirely, before employing oil: and likewise never to use those tools for succeeding operations, which had been used in preceding ones; each stage of the operation requiring particular tools, and which should be kept in closed boxes, in order to prevent the powders from being diffused, or scattered about, when not in use. Without taking these precautions, which must be particularly and minutely attended to, we should be liable to make fresh scratches instead of removing them.

After removing the marks left by the coarse pumice stone and water, by means of finely ground pumice stone and oil, we should wash it with soap and water, and dry it well with a white linen cloth: we must then examine it with a lens, or a magnifying glass, to see whether any scratches yet remain; if not, we may proceed to the polishing.

The softer metals are polished in different manners, according to their size and their uses; the larger gold works are, however, generally burnished; but the smaller gold works in jewellery, &c., and those in brass for watch work, are not burnished, but polished. The following are the manipulations. After having removed with oil stone powder, the marks of the file, &c. they smoothen them with blue and gray stones, and plenty of water: there are two kinds of these stones, the one soft, and the other hard; the first is designated by Brongniart, under the name of argillaceous schistus, and is the kind in question: the second kind is named by the above mineralogist, *schiste coticule;* this serves to sharpen tools upon. The pieces of watch work are always smoothed in this manner, until all the marks disappear, and which is known by washing them in the manner above mentioned with soap and water.

They finally proceed to the polishing by employing the tripoli from Venice, which is most to be preferred, and is either finely ground in water, or in olive oil, according to the different cases, for pieces of gold work, or the larger kinds of jewellery articles, and until they perceive their surfaces are become perfectly brilliant: they then

finish them with tripoli, reduced to an impalpable powder, and applied upon a very soft brush.

For polishing those pieces of watch work which are not to be gilt; after smoothing them with the gray or blue stone and water, they polish them with rotten stone, well washed over, and consequently very fine, ground up with olive oil, and finish with dry rotten stone.

This rotten stone is, according to M. Brongniart, a kind of very light tripoli, but finer and more friable than the other sorts. It comes from England, and is highly esteemed for polishing with; it is of an ashy gray tint, and is found in thin layers, upon the compact carbonate of lime, near Bakewell, in Derbyshire.

The polishing of steel is not executed in the same manner as in polishing the softer metals: the steel is not polished until it has been hardened, and the harder it is the more brilliant is its polish.

The substances we have above indicated for polishing other metals are not powerful enough to attack a substance so hard as this. We must employ emery, a substance so well known, as not to need describing here; it is used after having been ground in oil.

The hardened steel is either polished flat, like glass, or cut into facets like a diamond, and, consequently, the lapidary's mill is used.

They commence, by smoothing the work with emery rather coarse, then with finer emery, and finish with the finest. The smoothening being perfectly effected, they polish it with English rouge (tritoxide of iron) and oil, and, finally, finish it with the putty of tin (peroxide of tin) and water; but if upon mills or laps of zinc, then without the use of water. When the steel articles consist of raised and hollow work, they are smoothed and polished with the same substances; but the instruments are, as in the case of the less hard metals, pieces of wood, properly shaped, and employed in the same manner. L.

[*Ib.*

The Antiquity of the Art of Paper Making.

It has been generally conceived that the first rudiments of the art of making paper, according to the process now in use, were acquired by the Arabians from certain Bukharian manufacturers, about the year 704, and by them introduced into Spain, in the eleventh century. We are, however, about to draw the reader's attention to a work which throws an entirely new light on the subject, and goes far to establish a remoter date. The conjectures of former investigators have been derived exclusively from a consideration of the *materials* employed by the ancients; but our learned friend, Musumeci, in his recent essay "on the ancient use of various kinds of paper, and the art of making it,"* has taken up the subject on the only grounds from which clear and positive inferences can be drawn; he has inquired into the *mechanical means* by which those materials were produced, and instituted a "comparison of the process for

* Catania, 8vo. 1829.

making common papers, as now practised, with that which is recorded by the ancient writers." In doing this, he has also communicated the relative results of his researches.

Musumeci collects from Pliny,* the only one among the ancient authors who treats at any length of the art of making paper, that there were seven distinct kinds of paper known in his time;—the *Hieratical*, or *Sacred*, (afterwards called Augusta,) which was of so delicate a texture, as to be ill adapted to the purpose of the pen;—the *Amphitheatrical*, so called from the spot where it was manufactured, which was originally of very coarse quality, and fit only for common use;—the *Fannianal*, which was the same as the latter, but was ameliorated in quality by Fannio, from whom it derives its name;—the *Saitical*, first made in Sai, a town in Egypt, and composed of the vilest refuse, such as woollen rags, and the like;—the *Tenionical*, a coarse paper, resembling the bark of trees, valued more for its weight than its goodness;—the *Emporetical*, or *Emporical*, which was unfit for writing, but much used in trade;—and, lastly, the *Papyrus*.

We collect from the same authority, that all these kinds of paper corresponded, in a greater or less degree, with those of modern times; and that the present method of making them does not differ from the ancient. It is evident, therefore, that former inquirers, having erroneously considered ancient paper to be identical with papyrus, have been seduced into equivocal and ill founded conjectures as to its nature. Now what does Pliny report? "Every sheet of paper is made from materials in a damp state, composed of a substance derived from the fibres of vegetables; both sides being dried on a low table or superficies, of whatever length it is desired the form or frame of the paper should possess; the lattice (or wire) work is afterwards turned, and the sheet is complete." If it be added, that "the sheets are laid in a press, dried in the sun, placed together carefully with the most minute respect to quality, and sorted into bundles or quires," all which operations are recited by Pliny, we can arrive at no other conclusion than what Musumeci has insisted upon, namely, that the process followed by the ancients is precisely analogous with that which is pursued at the present day. It appears, on further investigation, that the frames which the ancients used for their paper were not dissimilar to our own; that they were made of brass; and that the process of sizing was much the same; the dimensions as numerous; the uses as similar; and the defects as striking, as occurs with our own papers. It is quite obvious from these facts, which rest equally upon Pliny's testimony, that paper itself, though styled "papyrus," was not a composition made with the small pellicles of the plant which bears that name, and glued together by the muddy waters of the Nile, as former interpreters have affirmed, but that it was manufactured under a process of maceration, whereby the pellicles were reduced to a pap; the only means capable of imparting to

* Nat. Hist. lib. 10. cap. xi. xii. et xiii.

it that substance, whiteness, delicacy, &c. which Pliny so clearly indicates.

An indisputable proof of this fact exists in the papyri, lately described by Champollion, which cannot possibly have been formed by mere contexture, but must have been the result of maceration, and a fusion of the parts into one another. The same remark applies to the sort called *Saitical*, which Pliny states to have been made from rags and the vilest refuse. The process appears to have been known in times posterior to those of the Roman naturalist; for Cassiodorus, who lived at the emperor Theodoric's court at Ravenna, when recommending paper making to the assiduous attention of his contemporaries, makes special mention of maceration, but never of contexture. It should also be recollected, that, in Cassiodorus's time, five centuries later than Pliny's, Ravenna was celebrated for the manufacture of paper, which was composed of the *scirpus ravennatus*—in all probability, nothing more nor less than the common rush of our own rivers. Ginnani is of opinion, that this was the paper which constitutes the greater part, if not the whole, of the papyri now extant in the principal libraries of Europe: a circumstance which serves to strengthen the opinion many have entertained, that the papyri of Herculaneum were made of a pap, derived from the refuse of old leather, and capable, as results from repeated experiment, of resisting the effects of fire and water. [*Athenæum.*

On the dark precipitate of Platina of Ed. Davy, and on the property of spongy Platina. By M. Liebig.

The black precipitate of Davy is obtained by heating the sulphate of the oxide of platina with alcohol. This substance, when dried, emits an ethereal odour, and possesses the remarkable property of becoming red hot when moistened with spirit of wine, and continuing so as long as the alcohol remains. Acetic acid is formed during the ignition.

M. Doebereiner ascertained that this substance absorbs all the combustible gases, but does not absorb either oxygen or carbonic acid. Saturated with hydrogen and placed in contact with oxygen, it effects their combination, and becomes incandescent. Presuming that finely divided platina might possess the same property, he tried it, and thus discovered the remarkable inflammation of hydrogen by spongy platina.

The best mode (according to the author) of obtaining the black precipitate, is to procure the *chloruret* (chlorure) of platina, by heating strongly, and for a long time, the *chloride* of the same metal, and to treat this chloruret, which has a greenish yellow colour, with a concentrated solution of potash. It forms with heat a perfect solution, dark and thick, into which alcohol is to be poured by slow degrees, shaking it well. In a short time it effervesces strongly, discharges much carbonic acid, and a very heavy velvet black powder subsides, which must be boiled successively with a little alcohol, hy-

drochloric acid and potash, and lastly four or five times with water, and then washed and dried in a porcelain capsule, without coming in contact with a filter or any organic substance.

This dark powder is granular and hard, and loses no weight by being strongly calcined in the air. It dissolves in aqua regia, and gives a limpid solution, which contains only chloride of platina. Moistened with spirits of wine, it quickly ignites, and produces acetic acid; placed in a receiver filled with oxygen, over mercury, and moistened with alcohol, the mercury soon rises, acetic acid is formed without the least trace of carbonic, and in a week or a fortnight the oxygen is completely absorbed.

In the air, it instantly inflames hydrogen. Its specific gravity is about 16. It is therefore nothing more or less than metallic platina extremely divided, acting like spongy platina, only in a more intense degree.

Metallic platina precipitated by zinc, from its acid solution possesses the same properties.

The platina black (to avoid periphrasis) possesses in the highest degree the property of absorbing and retaining a multitude of gases.

If it is not boiled well in water, or if, before drying it, it is moistened with spirits of wine, the latter cannot be expelled entirely even under the air pump. If, in this condition, it is heated to the temperature of boiling water, it begins to ignite, and burns the paper on which it is placed. Even though entirely deprived of alcohol, and after being dried in an exhausted receiver aided by the presence of sulphuric acid, if brought suddenly into contact with air, it becomes occasionally so heated by the absorption as to ignite and burn the paper.

The solution of chloruret of platina in potash, being mingled with a notable quantity of nitrate of copper, forms by boiling in spirits of wine, a precipitate, which, though it contains at least twice as much oxide of copper as platina, retains the property of igniting with alcohol.

According to Mr. Doebereiner, one hundred grains of platina black absorb twenty cubic inches of hydrogen gas. This reduced to comparative volumes gives one to seven hundred and forty-five, which sufficiently accounts for the great elevation of temperature and ignition with hydrogen or alcohol.

Even iron possesses an analogous property. If obtained by the reduction of its oxides by means of hydrogen, it is in such a state of extreme division as to combine with oxygen, so rapidly as to inflame at the common temperature.

Both the black and the spongy platina lose the property of inflaming by continued use, owing to their becoming more dense or less porous, or from having their pores obstructed by foreign matter; or from the air which they contain losing its oxygen. The method of restoring the property is to boil it in nitric acid, which has no other object than to expel and replace this air. Boiling the sponge in water answers the same purpose.

The absorbing power of finely divided platina appears to be analo-

gous to that of some other substances, except that it acts so much more powerfully on inflammable gases. Charcoal absorbs very little hydrogen, not so much even as dry wood. The effect in each case doubtless depends in a great measure on the relative dimensions or figure of the molecules of the gas and of the imbibing substance. Hydrogen contained over mercury in a receiver, which has a crack in its upper part, will gradually escape and the mercury will rise, in opposition to its gravity. No other gas possesses this property.

It would appear reasonable to ascribe the ignition of the spongy platina in part to the extermination of latent heat, arising from the affinity of oxygen and hydrogen, or in other words, to electrical action. But charcoal absorbs both ammoniacal and muriatic acid gases in equal proportions, when the electrical states are directly opposite. Affinity therefore cannot be the cause of the absorption, nor is it more probable that it is so in the case of platina and hydrogen.* [*Annales de Chimie.*

FRANKLIN INSTITUTE.

Report of the Committee of Premiums and Exhibitions.

To the Board of Managers of the Franklin Institute, for the Promotion of the Mechanic Arts, the Committee of Premiums and Exhibitions respectfully report:

That in pursuance of the arrangements previously made, their 6th exhibition of domestic manufactures was held at the Masonic Hall, on the 14th of September, and continued open for five successive days, during which it was most extensively visited, both by the members of the Institute and by the public at large. It is conjectured that not less than 20,000 persons visited the exhibition, all of whom experienced, we believe, the highest satisfaction at the great improvement it manifested. It was not so much by the number or quantity of the articles deposited, as by their great excellence, and by the visible amelioration in their quality that this exhibition distinguished itself from all preceding ones. We do not propose to notice here (indeed it would be impossible to do so satisfactorily). all the various objects presented; as many were brought in after the exhibition had commenced, and could not be regularly recorded in the catalogue. We will first report on those articles that claimed a premium.

Of the 37 premiums proposed by the Institute, three only are adjudged to be due.

The first is "for the best stock or standing vice, equal to those called Tower Vices, and weighing thirty pounds or upwards, not less than three to be exhibited," which the committee consider to be

* Has the experiment been tried of causing dry powdered fresh charcoal to absorb a portion of ammonial gas, and then to place it over mercury in a receiver filled with muriatic acid gas? would ignition ensue?

fully deserved by Archibald Lamont, of Pittsburg, (Pennsylvania,) for the vices presented by him. In execution they are reported by competent judges to be quite equal to any imported; in design, they offer a variation from those in general use, the screw of the box being cut out of the solid, while in the English vices, the thread of the box is brazed in. This will present the advantage of greater durability. The temper of the vices was tried and ascertained to be very good.

The 2nd premium was awarded to Jacob F. Walter, of this city, for a cooking stove, invented by him, and which has been ascertained to perform well, the various operations of cooking, with anthracite coal; the cost of the stove being only thirteen dollars. The object of the Board in offering this premium, and in limiting the price at fifteen dollars, is understood to have been to encourage the extension of the use of anthracite in families whose restricted means have hitherto disabled them from purchasing expensive stoves or grates. The simplicity and cheapness of Mr. Walter's stove, will, in a great measure, effect this; but the committee deem it their duty to state, that it is, in their opinion, liable to a serious objection, which is, that the objects intended to be cooked are exposed to the gases resulting from the combustion of the coal. This, which is said to produce no injurious effects under ordinary cases, might become highly objectionable if a more impure kind of coal than that now found in our market were brought from the mines. It is not difficult to foresee that instances might arise in which these gases would assume very unpleasant, and perhaps even very dangerous properties. As, however, Mr. Walter's stove meets the conditions proposed by the Institute, the committee have not felt themselves at liberty to recommend to the Board to withhold it; but they would suggest that a premium be offered for the same object next year, with an express condition that the furnace of the coal shall not come into contact with the victuals exposed for cooking. The price might also be reduced to a lower limit. Mr. Walter will, of course, be expected, before he receives the medal, to give the usual assurance to furnish any required number at the same price, and of equal quality.

The Institute had offered premiums to the maker of a vegetable oil that would answer as a substitute for olive oil, or for spermaceti oil; whether by this they intended that it should answer all the purposes of olive oil, or merely some of them, does not clearly appear; but being desirous to give it the most liberal construction, the committee recommend the awarding of a silver medal to Charles A. Barnitz, of York, Pennsylvania, for the sunflower oil exhibited by him; it is not fit for the uses of the table, unless by persons who prefer a very sapid oil, but it may be employed with advantage in painting, as it is highly siccative, and is applicable in many other cases as a substitute for olive oil; they therefore coincide with the judges on chemicals in considering it as a valuable accession to our stock of native productions. They understand that it is already manufactured and consumed in various arts to a great extent.

Of the other premiums proposed, the committee conceive that

none are strictly due. This is, however, not unexpected, as many of those related to manufactures known not to be as yet established in this country, but to which the Board thought proper thus to invite the attention of the public. The committee, following the precedent set to them on former occasions, have, however, agreed to recommend to you to award premiums to the following persons.

1. To Messrs. D. and J. Henderson, of Jersey city, for the Flint Stoneware exhibited by them, a SILVER MEDAL. Competent judges have reported to your committee that "it is equal in quality to any ware of the same kind known to them, and superior to any made in this country. It is a strong and handsome ware." As it is comparatively cheap, and an article likely to be extensively used in families, the committee think this manufactory deserves special encouragement.

2. It has been represented to us that the manufacture of Leno established in this city, by Joseph Ripka, was one entitled to notice on account of the great perfection and cheapness of the articles made by him; and the committee having observed with great pleasure his indefatigable exertions to promote American manufactures by the introduction of new fabrics, have agreed to recommend to the Board to reward him with a SILVER MEDAL.

3. Of all the articles exhibited this year, none, we think, attracted more notice, or excited more interest, than those of silk. The various publications which have been made on this subject for several years, and in which our fellow citizens have taken a prominent part, had awakened the public to the importance of this manufacture. The committee have received some very able observations on the subject of silk goods, from one of the judges of this article, and as they propose to recommend the publication of a portion of them in the Journal of the Institute, they deem it unnecessary to enter more largely upon it here. They will confine themselves to the observation, that they are unanimously of opinion that a SILVER MEDAL should be awarded to Mr. John D'Homergue, of this city, for his interesting display of American silk in all its conditions, from the cocoon to the most perfect manufacture. Your committee do not wish to be considered as embarking in the questions which have agitated the public mind on the subject of silk; these they believe to be foreign to the objects of their appointment, but think they may without trespassing upon forbidden ground, bear their evidence to the intimate acquaintance with the subject manifested by Mr. D'Homergue, and evinced in the various specimens manufactured with his own hands. Had there been the requisite quantity of sewing silk, no doubt can be entertained that he would have been entitled, *of right*, to the premium.

Of the extent which the manufacture of silk is likely soon to acquire, the committee received some information from a letter communicated to them, stating that one individual in Connecticut, had received last season at least eighty thousand skeins of sewing silk, manufactured in that state.

4. The committee deem this a fair opportunity of calling the at-

tention of the Board to a machine "for cutting veneers in one continuous sheet," lately invented by Caleb B. Burnap, of Belfast, Waldo county, Maine, patented May 1, 1829, (Journal of the Franklin Institute, vol. iv. p. 120.) It has been described to them by competent judges to be a great improvement in the art of sawing veneers, as it shows the whole figure of the wood, which could not be produced in any other way; the machine is simple, and as it has been more than a year in operation, without its novelty being contested, (as far as your committee are advised,) they deem it proper to recommend the awarding of a SILVER MEDAL to the inventor. There were, at the exhibition, several pieces of ash and maple veneers obtained by this machinery, and the furniture manufactured with them was very fine.

5. Believing that the manufacture of cabinet ware and house furniture is one in which our city is deeply interested, from the high reputation of its mechanics, and the extensive commerce which it carries on in this branch of industry, the committee had observed with regret that there seemed to prevail too little anxiety to innovate in the designs, and that while the workmanship continued to improve from day to day, the forms remained unaltered. A slight deviation, and it is generally believed a real improvement in the mode of attaching the looking glasses of toilets, was manifested in a very beautiful specimen of maple work, exhibited by Mr. John Jameson, of this city, and with a view to evince their anxiety to promote such innovations, the committee have agreed to recommend that a SILVER MEDAL be presented to him. They understand that this piece of furniture was the exclusive work of Walter Pennery, a youth apprenticed to Mr. Jameson. As the execution of the work reflects great credit upon him, he fully deserves an honorary mention.

6. It having been represented to us by competent judges, that a piano forte made by F. W. Pommer, jr. (a lad of fifteen years of age) exhibited great ingenuity and precocity of skill, and the judges having "desired that such early evidence of talent and perseverance should be rewarded by some mark of approbation," the committee have (after ascertaining that the instrument was wholly and exclusively the manufacture of this youth,) agreed to recommend that a SILVER MEDAL be awarded to him for it. The committee desire it to be distinctly understood, that it is not for the excellence of the instrument, or the beauty of its workmanship, which they wish to give a reward, but for the talent manifested by the young artist.

7. They also think that a SILVER MEDAL is due to John Yard and Co. of Morrisville, (Pennsylvania,) for the splendid display of mother of pearl work, manufactured and exhibited by them. This is almost a new branch in this country, and the perfection which it displays entitles it to a favourable comparison with the best specimens of foreign workmanship.

8. The committee observed with pleasure the great notice taken by the public of the splendid lamps, chandeliers, &c. exhibited by Christian Cornelius, of this city. The magnificent one made by him for one of our churches, is a proof that for beauty of design and ex-

cellence of execution in this manufacture, we need not look abroad for superiority over our own mechanics; we therefore recommend that a SILVER MEDAL be awarded to him.

The committee have not thought it adviseable to extend further the list of premiums, and while they deem it impossible for them to do justice to all those that contributed to the objects of the Institute, by depositing specimens of their work, they trust they may be indulged in a few observations on some of the prominent articles exhibited.

They observed with peculiar interest the Margaric Acid manufactured by Messrs. Seybert and Vanuxum. The history of this substance is interesting. It appears that these scientific manufacturers attempted its preparation by the method recommended by the French discoverers, but found themselves foiled in the attempt; the process being incorrectly given, probably with a view to mislead such as would undertake to repeat it. This induced them to institute a course of experiments on fatty substances, the result of which has been the discovery of a new and original process, which, judging from the specimen exhibited, produces an article of even superior quality to the French. Had it been manufactured on a sufficient scale to warrant its being thrown into commerce, your committee would not have hesitated in recommending it for a premium; but at present, they confine themselves to the expression of their hopes that before the next exhibition it may become an article supplied in sufficient quantity to entitle it to rank among the manufactures of this country.

Among the chemicals, there were specimens of sugar of lead, of the manufactory of Messrs. Wetherill, and of Mr. John Harrison, of this city, both deserving of honorary mention. They also noticed the chromic yellow and white lead of the Messrs. Wetherill, the bi-chromate of lead of Mr. Badams, of New York, the samples of West's superior rouge; Mr. Cashing's fine Cologne water, and the black lead crucibles of the Ixion works of Barton, which they understand have been extensively and successfully used.

The marble mantel pieces of domestic and foreign materials, exhibited by Messrs. John Struthers, Peter Fritz, Frederick Fritz, and Isaac B. Garrigues, maintained the high reputation of their makers.

The exhibition of piano fortes was unusually interesting; they were made by Messrs. Loud and Brothers, Charles Pomer, C. F. L. Albrecht, C. Myers, and J. J. Mickley, of this city. From the first of these skilful artists they noticed a three stringed piano, remarkable for its force and equality of tone, and the one chord piano by the same maker, merited attention for its power and simplicity, while it appeared to the judges "to be particularly calculated for the country, where the difficulty of keeping instruments in tune is severely felt."

The cabinet ware made a very fine show, and the committee are indebted for it to the zeal of Messrs. John Jameson, Joseph Akens, A. G. Querville, J. A. Stewart, Wm. Christie, and Wm. Browne, of this city, and to Mr. Prince, of Salina, New York, from whom

they received a very handsome writing desk and work table. When it is recollected that these articles were, for the most part, not made expressly for exhibition, but that they were taken indiscriminately from their extensive warehouses, they from this circumstance acquire additional interest.

The same observation applies to the coal grates and stoves, which displayed great improvement in elegance of form, and in the excellence of their workmanship, and also a more intimate acquaintance with the principles of science, which should never be disregarded in this manufacture. They were from the stores of Messrs. S. P. Morris, Jonas Gleason, Dennis Murphy, George Godfrey, Thomas Rodgers, jr. and N. Lloyd and Son. The judges also visited and made report on two grates applied to culinary purposes, invented by Charles Savage and by Jacob F. Walter; both of them were in operation, and gave great satisfaction to those persons that had used them; that by Mr. Savage was not liable to the objection noticed in Mr. Walter's cheap stove, to which the premium was assigned. A very fine fender, made by Thomas Barnhurst, was deserving of particular notice.

A good display of porcelain, consisting of upwards of one hundred and fifty pieces, manufactured by Mr. William E. Tucker, exhibited considerable variety of forms, designs, and styles, and elicited much admiration. It was gratifying to observe, that the premiums awarded to this enterprising manufacturer, on former occasions, have stimulated him to further exertions. Much improvement was apparent, especially in the painting and other ornamental parts, and the committee remark that the forms are generally chaste, and copied from the best models. They cannot omit also paying a merited compliment to Messrs. Smith, Fife & Co. of this city, for two beautiful porcelain pitchers, exhibited by them, and the committee had only to regret that their display was not more extensive.

The artificial teeth manufactured by Messrs. Van Pelt and M'Ilhenney, are worthy of notice, as possessing most of the qualities that are desired in such articles. The enamel is even, strong, of good colour, and bright; and they are exempt from the principal fault in teeth of this description, namely, roughness, which occasions so unpleasant a sensation when such artificial teeth rub against the natural.

The committee note with pleasure a good collection of fire bricks, slabs, muffles, cupels, &c. from the justly celebrated manufactory of Mr. Berry, of Baltimore.

In woollens, our display was much more limited than on former occasions. Our manufacturers are, we believe, turning their attention chiefly to cloths of a moderate price, which they are unwilling to send to an exhibition where they apprehend that they may be brought into comparison with higher priced goods. We have to regret that the views of the Institute still seem to be misunderstood on this subject. Goods of all qualities with the prices annexed will always be cheerfully received and judged accordingly. The Institute is aware that in a country like ours, the demand for high priced articles must always be limited, and that the intelligent

manufacturer will generally look to a coarser article for a more safe and a more extensive market.

In cotton goods the display was fine and interesting, but the committee pass over it rapidly, as they propose recommending to the Board to publish a large extract from the able report made by the judges on this article.

In addition to the silk manufactures of Mr. D'Homergue, the committee received fine specimens of sewing silk from Mr. Bulkley, of Hampton, Connecticut, also some prepared by a number of young ladies in Connecticut, and by Miss Brush, of Bedford, New York. The latter was obtained on the Italian reel, under the direction of the Pennsylvania Silk Society, and was declared by competent judges who tried it in tayloring, mantua making, and hat manufactories, to be equal in all respects to the imported silk.

In mechanics, we observed various machines, such as clocks, models of rail-road cars, or wagons; of canal boats; of agricultural implements, &c. all of which were referred to the committee on inventions, from whom a report may be expected on such as deserve special notice. These articles attracted considerable attention, and in this respect the exhibition will be useful in extending the names of the artists. We record here a curious pipe for mineral water, which is formed of tin coated with lead, manufactured by the Messrs. Wetherill, and which may prove valuable in the arts.

The committee think it also proper to notice the very fine carpets exhibited from the manufactures of John M'Fee and John Scott, and three fine rugs made by Lermont, Tannahill, & Co. of Germantown; also the Brussels rugs made by La Chapelle.

There were also some cast iron vices, made by Mr. M'Cord, of Washington county, New York, which attracted the attention of the committee, chiefly on account of the arrangement of the ball and socket washer, an arrangement which appeared to them new, and which may offer some advantages, but upon which they would not express any decided opinion, believing that experience will furnish the best test of its value. The planes by Kennedy & Co. of Hartford, Connecticut, by Emanuel W. Carpenter, of Lancaster, Pennsylvania, and by Jacob White, of this city, were deserving of great praise.

The patent screw auger, by George Shettee, of York, Pennsylvania, is thought deserving of notice.

The cutlery of Messrs. Morse & Co. of Worcester, Massachusetts, and the wood screws of Mr. L. Gougon, of Philadelphia, are very fine articles, which will command a ready sale if the maker can afford to dispose of them at the prices charged for similar articles of foreign manufacture.

They also advert with great pleasure to the fine edge tools manufactured by Dunlop, Madeira, & Co. of Chambersburg, Pennsylvania.

A great display of japanned waiters and other work, by Messrs. Nash, Ogle, Mustin, and Blackmore, indicate constant improvement. The different branches of hardware are evidently those which have made most progress, and were we not afraid of trespassing too much

we would with pleasure make large extracts from the able and minute report of the judges on these wares.

Some very good blister steel was exhibited, but none superior to what obtained a reward at former exhibitions. Very handsome iron, rolled by Reeves and Whittaker, was deposited by them.

The very splendid display of glass contributed as usual to enhance the beauty of the exhibition. The cutting by Daniel Linan, by M'Cord and Shiner, and by Scrimger and Dockety, bore ample evidence of the skill of these able artists. It was tasty, regular, and well executed. The glass was clear, white, and free from defects.

The Institute have on former occasions manifested the deep interest they take in the introduction of the manufacture of straw bonnets in this country; the perfection exhibited in the specimens presented on former occasions, seemed to leave nothing to desire, but those presented this year, far surpassed all others. They received an universal share of attention from the fair visiters of the exhibition, and the judges have reported to us that the split straw bonnets made by Mrs. Henly, of this city, from plat made in Boston, excelled any thing of the kind they had ever seen. We are precluded from recommending them for premium, by the knowledge we have that at the time of the formation of the list of premiums for 1830, the managers were unanimously of opinion "that a due regard to the other branches of industry, and to the funds of the Institute, would not justify further premiums on this branch of industry, while they regretted that all their efforts had been unavailing to call the attention of Pennsylvania to its importance."

We must not omit to mention the splendid display of silverplate from the workshops of Messrs. Thomas Fletcher, Edward Lownes, and R. and W. Wilson. In combs, brushes, books, stationary, specimens of the fine arts, of book binding, fancy articles, leather work, &c. &c. &c. there was the usual variety and excellence, but our limits do not permit us to particularize them.

At the conclusion of the exhibition, the committee thought it expedient to hold a public auction of such goods as were intended for sale. In doing this, they yielded to the wishes of many of the depositors. The sale was much more successful than that attempted on a former occasion; but it was not sufficiently so to justify, in our opinion, a perseverance in this plan. There seems to be a difficulty in bringing purchasers from the usual auction stores to a place out of the ordinary precincts of business; a distrust exists that the goods are valued much above their ordinary market price, and that they are not offered without reservation. These considerations affect unfavourably both the purchaser and the seller, and when we advert to the great trouble and risk that attend such a sale, your committee cannot recommend its being again attempted.

It may not be amiss to state here, that all the goods deposited were restored to their owners without any material injury or loss; a fact highly creditable to the population of our city.

The committee think it proper to make one or two observations upon the general character of the goods exhibited, which they trust

may not be unprofitable to our manufacturers. Experience has shown that those goods are the most popular, and are held to be in best taste, which are the plainest and the neatest. It is more by the elegance of their forms, by the chasteness and appropriateness of their ornaments, and by the simplicity and uniformity of their colours, that taste is displayed and admiration secured. As to those works in which gaudiness takes the place of neatness, in which all the colours of the rainbow are brought together, and of which uncouth carvings, heavy mouldings, and overloaded gildings, are the chief recommendations, although they may please an immature and an unimproved taste, they cannot, and experience shows that they do not, find favour with a discerning public. This observation applies to cabinet ware; to pianos; to porcelain; to glass ware; to marble mantel pieces; to all kinds of architectural works; to coal grates, &c. and as far as colours are concerned, to printed cotton and silk goods, &c. &c. We take pleasure in stating that the manufactures of this country are daily becoming less liable to censure on this score. Another point in which we observe great improvement, since the first exhibitions of the Institute, is in the general finish of the articles; formerly, while those parts which were intended to be prominent were overloaded with meretricious ornaments, coarsely finished and unskilfully applied, the rest were left in the rudest condition; now the whole of it approaches more to that finished style of elegance which so peculiarly distinguishes the productions of England. To this point we would chiefly invite the attention of our manufacturers; although much has been attained, still something remains to be done.

Finally, the committee beg leave to recommend to the Board the adoption of the following resolutions, the justice of which they deem too apparent to require any comment.

Resolved, that the thanks of the Institute be presented to the manufacturers and mechanics of the United States, who have contributed to the success of the exhibition, by depositing specimens of their industry and skill.

Resolved, that the thanks of the Institute be most specially presented to the gentlemen of the committee of arrangements of the exhibition, and to the committees of judges, for the friendly and liberal zeal with which they co-operated in the objects of the Institute.

Resolved, that the thanks of the Institute be offered to Messrs. Jennings, Thomas, Gill & Co. for their liberality in assigning over to it the amount of their commissions on the sales at auction on the 20th ult.

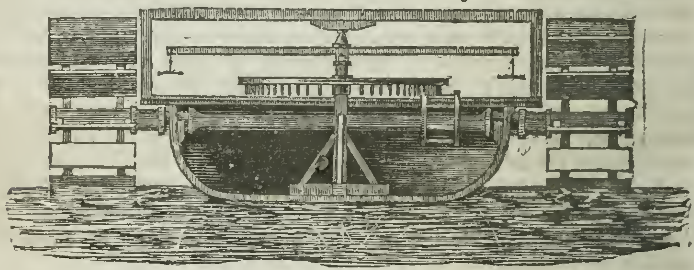
Modern Antiques, No. 4. *By the Editor.*

Horse Boats.

Those persons who are familiar with the progress of mechanical inventions, know that the paddle wheel, constructed like those ordinarily used in steam boats, has been repeatedly applied for the

propelling of vessels. The common impression, however, is, that the horse boat used at many of our ferries, is a modern invention, suggested by the employment of steam boats, and consequently brought into use at a later period than they. The subjoined cut represents a transverse section of a boat invented by M. Le Compte de Saxe, and described in the 6th volume of the *Machines Approuvées*, under the date of 1732. There are three different views accompanying the description, two of which are section, and the other a perspective view of the boat under way, with the horses at work, and the whole bearing a strong likeness to some of our modern acquaintances.

This boat, we are told, will not merely go against the current itself, but may be employed to tow other boats after it. The original drawing has letters of reference, and a corresponding description, but these we have not thought it necessary to give, as most of our readers are familiar with similar machines, *of modern invention.*



Revolving Oars.

An invention still more ancient is described in the first volume of the same work, and bears date in 1699. Two plans of propelling by revolving oars, are given by M. Du Quet. The first we shall not notice, but the second so nearly resembles a contrivance which has been once patented in England, and twice in this country, within the last two years, as to give to it a strong claim to a place in the list of *piracies by the ancients.*

Fig. 1.

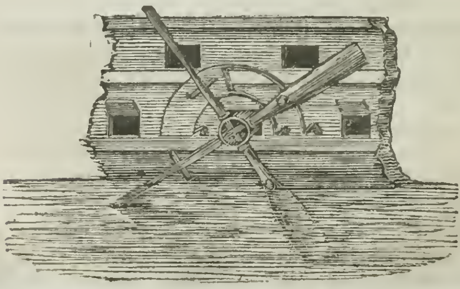


Fig. 2.

Fig. 1, shows a part of a side of a vessel, through which projects an axis carrying the revolving oars. The oars revolve with the axis in the manner of paddle wheels, and they also revolve on their own axes, so as to pass into and leave the water edgewise, whilst they act upon it, when immersed, by their flat sides. The manner in which this is effected, is shown in Fig. 2, where one pair of oars, and the apparatus for turning them, are represented.

The two oars, *a*, *a*, have their flat sides at right angles with each other, and are united together and turn in the axis, *b*. Near the middle of each oar is fixed a pin, *c* and *d*, which stands perpendicularly to their surfaces. These pins project equally on either side. Two semicircles, *e*, *f*, *g*, and *h*, *i*, *k*, are attached to the side of the vessel, as shown at Fig. 1. The part, *f*, *g*, *h*, *i*, is solid, whilst the part *i*, *f*, *e*, *k*, is an open space, between the segments *f*, *e*, *i*, *k*, allowing the pins *c* and *d* to pass round when standing in the position of *c;* but when these touch against the side, *i*, *f*, the oar is necessarily made to turn, so as to produce the intended effect. By this revolving of the oars on their own axis, we are told that the difficulties attending revolving oars will be entirely removed.

After the lapse of about one hundred and thirty years, the same idea, and almost the same plan for carrying it into effect entered simultaneously into the heads of two or three different projectors.

On the 16th of March, 1829, Adolph Hilbronn, of New York, obtained a patent for an improved wheel with revolving paddles, which may be seen described in vol. iv. p. 194, accompanied with a copper-plate. A little time previously, a gentleman in England, who had been the coadjutor of Mr. Hilbronn, obtained a patent there for the same thing; and on the 11th of June, in the same year, Mr. Benjamin Howard, of Worcester, Massachusetts, patented a wheel of the same kind.

When we say that these are all essentially alike, we mean that they are so in the leading idea and object of their construction, whilst in their details the difference may be considerable. When inventions interfere with each other, their authors seize upon the most trifling matters of detail, or arrangement, as things of great importance; this, however, is not the view which we take of the subject, as we think that the difference between invention and mere arrangement is very great, although it is commonly overlooked.

Pittsburgh Mechanics' Institute.

In this flourishing city a Mechanics' Institute has been recently organized, with a list of 180 members.

Robert Bruce has been appointed president, and Mr. Thomas Bakewell secretary. A copy of their constitution has been forwarded to the Franklin Institute, and the foundation laid of that friendly intercourse, the establishment of which is most desirable among all similar societies.

It is expected that a course of lectures on chemistry will be delivered during the ensuing winter, and measures will be taken to add

to this a course of practical mechanics, as soon as the necessary apparatus, and a competent lecturer can be obtained.

The constitution declares the object of the association to be "the promotion of the useful arts and sciences. The improvement of its members in practical knowledge, and the advancement of popular education," and that "to effect the objects of this association, it shall, for the benefit of its members, hold meetings for reading and conversation illustrative of the useful arts and sciences; but no debate upon religious or political subjects shall ever be admitted."

"It shall procure collections of suitable books, and apparatus, and of models, or other specimens of the works of nature or art, and shall have power, when the resources of the society render it admissible, to establish a school upon the most approved system of instruction."

It need not be said that they have the ardent good wishes of the Franklin Institute for their most perfect success, and that whatever it can contribute towards an end so desirable, will be cheerfully accorded.

Plan of Mr. LEMUEL BLAKE'S *improved Case and Types.*

IN vol. v. p. 293, we gave an account of an improvement in the casting and setting of types for printing, patented by Wm. R. Collyer, of Boston, February 9th, 1830; and at page 368, an account of a patent nearly identical with the former, granted to Mr. Lemuel Blake, of the same city, and dated March 12th. To these articles our readers are referred for the particulars respecting them.

We know nothing of the question who is "the true and original inventor," nor are we interested in it; but as it is averred that there will be a saving of about twenty per cent. in the composition, and a lessened liability to typographical errors, the proposed improvement merits the attention of those who are concerned in printing, and are capable of forming a correct estimate of its value. We have, therefore, placed the plan of the case, with the note appended, as furnished by Mr. Blake, for that purpose.

Mr. Blake states that he originated this plan upwards of four years since, during which time he has investigated it with great care, and consulted with the most eminent printers, so as to give to it that form which should be the best in practice. The priority of his claim, he says, can be well established.

A similar plan was introduced in England by Earl Stanhope, but the arrangement of his combined letters in the case was inconvenient, and was found, therefore, to result in a loss instead of a gain of time; it was, of course, abandoned.

The united letters introduced by Earl Stanhope, have been placed in Mr. Blake's case, but are omitted in his specification, as he could not lay claim to them.

"The original plan was more extensive, embracing words and syllables of three letters, but after a long investigation, the inventor is satisfied that the above plan, by which twenty-seven new types

are introduced into the case, is carried precisely to the point of utility, without enlarging the present cases."

The Boston type and stereotype foundry have a fount of brevier, with the improved types, ready for sale, with the cases.

Plan of Mr. Blake's improved Case and Types, for which he has obtained a patent.

Spaces.	Spaces.	j	k	er	ed	if	in	so	ff	fi	ffi	’
&	be	b	c	d	e	i	is	ss	f	g	n Quadrats.	m Quadrats.
qu	by						it	s				
ll	l	m	n	he	h	o	of	or	p	w	we	Hair Spaces.
z	me			no			on	y			;	:
x	up	u	t	th	Spaces.	a	at	as	r	,	.	Quadrats.
v	us			to			an	re			-	

Great care has been taken to introduce the new types into the cases in such a manner as not to alter the arrangement of the letters in the old cases, but to place the new types beside or around the initial letters, so that the compositor must go to the usual box for the first letter, along side of which he will find the united letters.

Notice of a Large Magnet.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

The following is a short notice of the large magnet which is now the property of the Philadelphia Museum, and is deposited in their collection of philosophical instruments.

It was made in the summer of 1825, by myself, and its power tried in the presence of R. M. Patterson, M. D. now professor of natural philosophy, and chairman of the University of Virginia. It consists of fifteen bars, of what is called the "horse shoe" form, put together and secured by screws, in the usual manner. The bars measure around the outside 43 inches, and are made of the best shear steel. The "keeper," which is of soft iron, and the ends of the bars are accurately ground, so as to ensure a perfect contact in every part.

The whole instrument, keeper and rings complete, weighs 53 pounds. The bars were "touched" by a nice bar magnet, the property of Mr. Isaiah Lukens, according to his newly discovered method, in the comparatively short space of 30 minutes, and can at any period be restored to their maximum in the same time. A passing tribute of respectful notice is due to this gentleman, for his manner of making and "touching" magnets. He has most ingeniously reduced to a system, the art of giving to them their attractive power, performing in a few seconds, and with infinitely increased strength, that which, in the hands of the makers of mathematical and philosophical instruments, was, and still continues, a mysterious and secret business, involving much time and labour. This magnet on its first trial, required a force equal to 310 pounds to separate the "keeper" from the bars; this may justly be considered the maximum power of the instrument. After the removal of the "keeper," its force remained permanently 134 pounds, which is as justly considered its permanent maximum.

We have in this instance a much greater increase of power in comparison to weight, than has hitherto been considered possible in the formation of magnets of a large size: there is nothing on record (as far as our knowledge goes) that will compare with it, and our notice is given for the purpose (in a measure) of eliciting facts of a similar character.

Yours, respectfully,

Franklin Peale.

Philadelphia, October 18th, 1830.

Account of the experiments of Mr. J. Tytler, *on the preparation of Oleocere, or a wax for Candles, from Castor Oil.*

Nine years ago the following passage, from *Brande's, Manual of Chemistry*, suggested to Mr. Tytler a course of experiment on the product forming the subject of his paper, viz. "nitric acid, heated in

small quantity with any of the fatty substances, renders them harder, and considerably increases their solubility in alcohol. Among the vegetable oils, this change is most remarkably produced upon cocoanut and castor oils; the latter becoming converted into a solid matter, which, when cleansed of adhering acid by washing, resembles soft wax."

On reading this, it occurred to Mr. Tytler, that oil so consolidated might have sufficient firmness to form a candle. After a few necessarily rude experiments, Mr. Tytler adopted an improved mode of preparing what he calls oleocere, the great object being to keep up a uniform heat, and the preventing too high a degree of temperature. He thus describes the process: "I therefore made water boil in a large fish kettle, and mixed a quantity of castor oil and nitric acid in one of those China jars which are employed to hold preserves. Then carefully stopping the mouth to prevent the entrance of vapour, I placed this in the boiling water, and kept the whole upon the fire for about an hour, after which I took it off, and set it by to cool. The effect even exceeded my expectation. It hardened into an uniform mass of no disagreeable colour, and of very tolerable consistency. After a certain number of trials, experience taught me that the best proportion for mingling the substances was eighty parts of oil to one of strong fuming nitric acid, and having increased my apparatus, I continued with this receipt to prepare a considerable number of candles, which answered their purpose sufficiently well."

By degrees, however, he began to experience unaccountable variations in the process; for in spite of all his pains, the oleocere sometimes would not harden, but continue unalterably of the consistence of butter. For a long time he concluded these defects to proceed either from the entrance of watery vapour into the jars whilst boiling, or from the increasing heat of the weather at the time. To remedy this he took every precaution in shutting the jars, and when the process was over, placed them behind a tattie to cool. Still this was to no advantage, and many trials showed that the hardening of the oleocere was a matter of the greatest uncertainty.

Some time afterwards, being placed in more favourable circumstances for conducting his experiments, he adopted another plan, which we give in his own words: "I erected a furnace about four feet from the ground; on this was placed a large iron boiler to serve as a reservoir; immediately adjacent to this first furnace, was built another furnace about half the height of the former, on which was placed a round iron vessel whose side was about ten inches high, and whose capacity was such as to contain seven of the China jars already mentioned. In the side, about two inches below the level of the top of the jars, was fixed a pipe, so that the water might rise to this level and no more, whatever should be superfluous being carried off by the pipe. Having then a quantity of water to boil both in the reservoir on the copper furnace, and in the vessel on the lower, and having prepared a long copper syphon, I placed its short leg in the reservoir, and directed its long leg to the lower vessel, so that a perpetual stream of water should be conveyed from the upper receptacle

to the lower. By this contrivance, the water was perpetually kept boiling, and the quantity in the lower vessel was uniform,—its loss was perpetually supplied by the syphon, and its excess carried off by the pipe. There were placed seven of the China jars, with eighty parts of oil and one of acid. After boiling thus for an hour, they were taken out, seven more placed in their room, and so on for a third time."

We have been thus particular in describing the process, in the hope that those who have plenty of time and opportunity, may repeat Mr. Tytler's experiments, with the view, if possible, of bringing the product to perfection, and rendering it generally useful in those parts where castor oil abounds, but where wax may not be equally procurable and cheap. After all, however, perhaps the most eligible and economical plan will be found to be using the oil simply for the lamp, instead of converting it into oleocere.

Mr. Tytler found that dropping the oleocere from a height on the floor hardened it. He submitted a specimen of the substance to the meeting, which was harder and brighter than what is commonly obtained, but still too soft to form candles for burning in the hot weather; and notwithstanding his laudable perseverance and great trouble, Mr. Tytler does not appear sanguine as to the substance being very likely to prove useful as a substitute for wax in making candles.

The oleocere of cocoa-nut oil, prepared in the same way as that of castor oil, he found never hardened beyond the consistence of butter; its colour was paler, and it might perhaps enter advantageously into the composition of ointments.

[*Asiatic Journal*, No. 1, New Series, p. 66, 67.

Fountains of Fresh and Salt Water.

Marietta, Ohio, March 11, 1830.

TO PROFESSOR SILLIMAN.

Sir,—In the last number of the Journal of Science, I was pleased to observe the remarks of Mr. G. W. Long, upon the spontaneous flow of springs or water from the bowels of the earth. He says, "springs that flow spontaneously, are generally found on the sides of hills, or in the neighbourhood of them; and often in such situations as not to be easily accounted for, and to be, at the same time, objects of great curiosity. The flow of water from the bowels of the earth by boring, excites still more wonder, as the cause appears more hidden from our comprehension. In all these cases the hydrostatic principle which causes the discharge of the water, must be the same; that is, the pressure of a column of water superior to the pressure of the water raised; and in the absence of any other active force to cause this pressure, *it follows that it must arise from a superior fountain head.*" If this be correct on philosophical principles, can a sound reason be given, why a more copious fountain of water should be found by boring at the brow of the hills, from four to nine hun-

dred feet deep, perpendicular, than can be found by boring the same depth one hundred and sixty rods, or three hundred rods, back from the hill on the plain? For such is the fact; *salt licks* on the surface are found all through this western country, and generally at the edge of rising ground. Some of the largest of the *licks* are at the foot of the lowest hills; salt wells were sunk at these places to a great depth, and some in valleys, where strong licks were found, two hundred rods from the hills, which were not *high*, but without success. The wells were abandoned.

The citizens of this country have laid it down as an axiom, founded on experience of some ten or twelve years in the boring of the earth for salt water, to sink their wells at the brow of the highest hills, commencing on a rock, at the surface, if possible. No matter whether there is any appearance of *licks*, or of brackish water, within miles of the place. At the depth of from one hundred and seventy to eight hundred feet they obtain strong salt water, which gushes forth spontaneously, from some wells, six and ten feet above the surface, without being exhausted. In all cases the wells of the greatest depth, and at the brow of the highest hills, have discharged water with the greatest force. The hills are from sixty to two hundred feet high. When we take into consideration the depth of the wells, upon what principle of hydraulics shall we solve this problem?

There are now a great many salt wells, thirty or forty miles from this place, on the Muskingum River, near to Zanesville; and on Leading Creek, in the county of Meigs, several wells have been in operation for years, and make very beautiful salt, which sells at fifty cents per bushel.

I am, respectfully, your obedient humble servant,

NAHUM WARD.

[*Silliman's Journal.*

On making Artificial Pearls.

[From the *Dictionnaire Technologique.*]

THESE are small globules, or pear shaped bulbs, blown in thin glass, and each pierced with two opposite holes, by which it may be strung. These are afterwards prepared in such a manner as to greatly imitate the rounded and brilliant concretions, reflecting the irridiscent colours, which are found in certain bivalve shells, such as the pearl muscle, &c., and which bear the name of oriental pearls.

We can perfectly imitate the brilliancy and reflection of these natural pearls, by means of a liquid, termed essence of pearl, and which is prepared by throwing into liquid ammonia the brilliant particles which are separated by friction and washing from the scales of a small river fish, named the bleak.

These pearly particles, thus suspended in the ammonia, can be applied to the whole interior of these glass bulbs, by blowing it into them; after which, the ammonia is volatilized by gently heating them.

It is said that some manufacturers do not employ the ammonia; but instead thereof, suspend the pearly particles in a solution of isinglass, well clarified, and which they drop into the bulbs, and then turn them in all directions, in order to spread it equally over their interior surfaces. There can be no doubt, that in this mode of applying the pearly mixture, the same success will be obtained as in the before mentioned process, and that it will afford a layer of the same thinness and brilliancy.

It is important, to succeed in the perfect imitation of pearls, that the glass bulbs or pears employed should be of a slight bluish tint, opalized, and be also very thin, and likewise that the glass should contain but little potash, or oxide of lead. In each manufactory of these artificial pearls, there are workmen exclusively employed in the blowing of these glass bulbs, and which indeed requires a great skill and dexterity to succeed well therein; a dexterity, indeed, which can only be acquired by long practice.

The French manufacturers of these artificial pearls have at length attained a degree of perfection before unknown. We must add, that the bulbs are finally filled up with white wax. L***** R.

Alloy for the construction of Pumps and Cocks.

This alloy consists of 4 parts of tin, 4 of zinc, and 1 of antimony; these metals, when fused and well mixed together, have been found well suited to make good pumps. Cock metal is usually an alloy of lead, zinc, and antimony, to which more or less tin is added. The alloy described as good for pumps, is fit for cocks, but one to be mentioned is still better; of the two parts of a cock, viz. the box and plug, the latter should be harder than the former, and therefore contains more antimony. An alloy of 80 parts of tin, with 20 of antimony, is well suited for the plug, and one consisting of 86 parts of tin and 14 of antimony, for the boxes of cocks.

[*Industriel de Brusselles.*

Query respecting Mexican Plumbago.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

At page 128, vol. vi. of your Journal, I find in an interesting article on the manufacture of melting pots, &c. the following observation: "the plumbago is Mexican." I should like to know from what part of Mexico it proceeds. Inquiries made from various persons, induce me to believe that plumbago is not an article of exportation from Mexico, and that no mines of it have yet been worked in that country. If any of your readers can set me right, I hope they will do it.

Yours, respectfully,

X.

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

NOVEMBER, 1830.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN JULY, AUGUST, AND SEPTEMBER, 1830.

With Remarks and Exemplifications, by the Editor.

1. For a *Machine to Cleanse Grain from Foreign Substances;* Jesse Neal, Middlebury, Portage county, Ohio, assignee of Phineas Pettia, of Akron, in the same county, July 2.

An inclined floor, or trough, which may be made 12 feet long and two wide, and have ledges, or sides, of eight inches in width, on each side of it, is to be so fixed in a frame that a traversing motion may be given to it, endways, by means of a crank, or pitman. Upon this floor the grain is to be rubbed, which operation is thus effected. Pieces of timber, called followers, are to be cut in lengths equal to the width of the trough; they may be six inches wide, and five thick; these are to be laid across the trough about four inches apart, and retained in their places by blocks of wood projecting downwards from an upper frame, and passing between their ends.

The grain to be cleaned is fed on to the upper end of the trough, and when the proper motion is given the grain descends, passes successively under all the followers, and at the bottom is received upon a screen.

The claim is to a machine constructed on the general principles of the foregoing, which admits of variations in the particular arrangement, whilst the machine may be essentially the same.

2. For an improvement in the *Loom for Weaving Casinet and other Cloths;* James Hammond and John M'Clelland, Williamsport, Washington county, Pennsylvania, July 3.

This improvement consists in making such a connexion between three or four looms that one may with facility work the whole. The general construction of the looms is unchanged, but the three or four which are to be worked together, stand behind each other, in one common frame. Jointed connecting rods unite the slays of each loom, by passing through mortises made in the swords. One pair of treadles is made to work all the harness, by lines passing over their respective carriages; and so of the plucking stick, and other parts.

The claim is to "the manner of connecting together three or more looms by the connecting rods, in such a manner that one weaver can work many looms together with the same facility as he has heretofore been able to work one. Also the cords of the prickers, and the mode of constructing the carriages for the pulleys."

---

3. For a new and useful improvement in *Flouring Mills;* Jonathan Thompson, Ashtabula, Ashtabula county, Ohio, July 7.

This "Flouring Mill," adds another to the list of those grist mills which are sufficiently small to be portable, and in which stones of a very diminutive size are to be employed. The patentee proposes to give motion to both stones, but to move them with different velocities. The spindle of the lower stone is to be a tube, from which arms project out at right angles for the purpose of attaching the stone to it. The lower end of this tube rests upon a step, within which it runs; this step is perforated, to allow the spindle of the upper stone to pass through it, and through the tubular shaft or spindle of the lower stone. Upon each of these spindles is a whirl, each of which may be turned by a strap from a drum, such an arrangement being made as shall reverse their motions.

The straps are to be kept of a uniform tightness by means of tightening pulleys, which are borne up against them by a weighted lever.

The upper stone is to be pressed down by weights, as, in small light stones of the description intended to be used, the gravity of the stone itself would be inadequate to the effect which it is intended to produce. This pressure is to be made by means of a transverse beam, in the middle of which, on its lower side, is a metal box, to receive the end of the spindle of the upper stone. The ends of the transverse beam slide in mortises, to allow of its elevation or depression. It is drawn down upon the stone by weighted levers at each end, acting upon it through the medium of cords, or chains attached on its lower side.

The advantages said to arise from moving both stones, with different velocities, "are to increase the motion, and facilitate the grinding, and to prevent entirely the possibility of the clogging of the stones by the dampness of the grain, or from other causes. Both

stones being in motion, no particle of grain can remain stationary and impede the progress of others, but all are hurried to the circumference with exceeding briskness."

The manner of loading is considered as superior to any other; and the tightening of the straps by means of pulleys, is also mentioned as a very advantageous arrangement.

There is no *direct* claim to any part, and were we to *infer* what is meant to be claimed, it is the running of both stones with different velocities, the manner of loading the upper stone, and the mode of tightening the straps.

The running of both stones has been patented more than once, and we see nothing in the "different velocities," which offers any advantage over the moving them with the same velocities.

The arrangement for pressing down the upper stone is undoubtedly good, but this may be readily done, and, indeed has been done, by other means producing the same effect. If the particular method described is superior to those which have preceded it, this certainly must be deemed an improvement.

With respect to the pulleys for tightening the bands, however good they may be, they have no claim to novelty, and a patent based upon the use of them, could not be sustained.

We have given more space to the description of this apparatus than we usually spare for such a purpose; our reason for so doing is, that a small efficient grist mill, afforded at a moderate price, and driven by a power within the command of every farmer, is a desideratum; and we wish to point out to patentees the necessity of designating particularly what is really new in their machines, of claiming this distinctly, and of carefully avoiding to claim too much.

---

4. For a "*Self-adjusting Rail-road and Street Car;*" John Pollock, Hopewell, Chester county, Pennsylvania, July 7.

In the next number it is intended to give the specification of this car.

---

5. For an improvement in *Looms;* John Goulding, Dedham, Norfolk county, Massachusetts, July 7.

The improved apparatus cannot be described in words, we therefore shall give no more than the claim, which will show what is intended to be effected.

"What I claim as my invention, is, the method herein described, by which may be ascertained if the filling, or weft, breaks while running off from the bobbins, or the bobbins deliver all off, and by which ever cause of its so breaking, or running off, the loom will be stopped by the apparatus above specified."

---

6. For *Revolving Planes, and Sections of Rail-ways*, to be used in cross and branch rail-ways, and common roads crossing the same; Jonas P. Fairlamb, Newcastle county, Delaware, July 7.

The whole specification is comprised in the following words.

"I provide a circular plane, moveable at pleasure upon its centre, resting upon rollers, and moved by a pivot wheel geared into its face, or other cogs, placed in said horizontal circular plane, upon which plane I construct rail-ways corresponding and uniting, as moved around, with the rail-ways in any given direction;—the manner of using the plane is manifest; when a carriage is about to cross either way, nothing more is necessary than to place the rail-way on said plane to unite with the rail-road in the required direction. If it is required to change the direction of the carriage, not crossing the rail-road, the carriage must be received on said platform, and then all moves round together to the given direction."

"J. P. Fairlamb."

The foregoing plan we believe to be new, and, for single carriages, we think that it will answer well; but a revolving platform cannot be made sufficiently large to extend it beyond this use. But trains of carriages will be generally employed, and as each carriage would have to rest upon the platform, and be turned alone into the required direction, the trouble and delay must form a serious objection to its use. There is certainly room for better modes than any yet adopted, both for crossings for rail-roads, and bridges for canals.

---

7. For an improved *Mode of Fastening and Unfastening Window Blinds*, called a "Horizontal Spring Catch for Blinds;" William Phelps, Salem, Essex county, Massachusetts, July 7.

A catch made of iron, or other suitable material, with a spiral spring attached to it, is to be fastened to the lower rail of the blind; this is to catch upon a hook to keep it open, and upon a pin to keep it closed; the manner of doing this so nearly resembles many of those which are now, or were formerly, in use, that we know not upon what the claim to invention is founded.

---

8. For an improvement in the mode of *Breaking and Dressing Hemp and Flax, and of Thrashing Grain;* David Ball, Fort Edward, Washington county, New York, July 7.

The hemp or flax to be broken and dressed is to pass between several pairs of rollers of different constructions. In the drawing which accompanies the specification, six pairs are represented. The first pair have coarse flutes, the second are fluted more finely, the third are called open rollers, and consist of bars instead of flutes, so that the shives may fall through; the fourth are similar to the last, but finer; the fifth have fine angular flutes to hold the fibres firmly, and are called holding rollers; the sixth are called spring rollers; the bars or beaters of these recede from their peripheries towards the centre, and are borne out by springs: there are cams which, as these rollers revolve, force the beaters in, and allow them to spring out upon the fibres just as they are passing between them; their motion is very rapid, as they are intended to whip the flax clean.

When used as a thrashing machine, the upper row of rollers is to be removed, and an apparatus, figured in the drawing, is to cause the lower rollers to act on the grain. We cannot pretend to give a clear idea of the parts we have mentioned, without the drawing. They are well described and represented, and the claim is in the following terms.

"The parts which I claim are the *spring rollers*, and *open rollers*, of whatever materials they may be made; and also the *break* for thrashing; and the application of them to breaking, dressing, or thrashing, hemp, flax, or grain, or to acting upon any thing else."

---

9. For improvements in the *Machinery for Sawing, Jointing, and Smoothing Staves;* Daniel Toms, Auburn, Cayuga county, New York, July 8.

A sawing and jointing apparatus constitute the principal parts of this machinery. The saws are so fixed as to form segments of circles of different radii, according to the size of the vessel intended to be formed. The frame in which these saws are fixed is of cast iron, and is in the form of Hadley's quadrant, or octant. The saws used are mill, or cross-cut saws, placed within this frame, and secured there by screws, nuts and stirrups; the curvature given to each saw is such as to make it the segment of a circle whose centre is the angular point formed by the meeting of the sides of the frame. The frame is made to vibrate by a crank and pitman from a flutter wheel, or in any other convenient way.

The jointing is effected by two circular saws, each running upon its own axis, their distance from each other being adjusted according to the width of the stave. Their planes form an angle with each other which is to be varied according to the width of the stave, and the diameter of the vessel to be formed. The machinery is sufficiently well described and delineated, but there is no claim to any part of it, and the whole can scarcely be considered as new.

---

10. For improvements in the *Grist Mill;* Charles Langford, Claridon, Geauga county, Ohio, July 8.

This is another member of a family which has of late become very prolific, that of the small grist mills.

"The improvement claimed consists in the machinery following, by which the revolving stone is raised and depressed, and kept confined whilst revolving, at any desired elevation." That is, there is a screw and nuts for the purpose of holding the bridge tree wherever it may be placed.

---

11. For a *Thrashing Machine;* James H. Arnold and Jesse Bonsall, Belmont county, Ohio, July 8.

The patentees after describing the structure of their machine, (in doing which they might have copied many of the specifications already in the office,) say, "in this improvement is claimed the prin-

ciple of giving elasticity to the thrashers by means of springs, and the principle of feeding said machine by a diagonal, or inclined feed table or shoot; the application of the above principles either connectively or separately to the purpose of thrashing small grain, or seed of any kind, is what we claim as our improvement."

---

12. For an improvement in Judkin's ointment, called *Shepherd's Improved Specific Ointment;* Nathan Shepherd, Belmont county, Ohio, July 9.

After due consideration, we have determined to obtain absolution from a promise we formerly made not to publish recipes; in several instances we have felt that we were violating a duty to the public in not making known that of which it is their interest and their right to be informed; we ought, in fact, in the first instance, to have exempted empirical medicine from the operation of the rule, and this, hereafter, will be the case. In determining when to publish and when to withhold, we shall endeavour to take sound discretion for our guide; in making such publications, we violate no right, as the law makes every patent public; and the courts would vacate such as might be proved to be injurious.

The following is the recipe.

"Take half a gallon of flaxseed oil, boil it in a new earthen pot till it be sufficiently heated to turn a feather brown, then add one pound of red lead, stir them together for five and twenty minutes; to this add two ounces of spirits of turpentine, and half an ounce of olive oil; stir it again from 10 to 15 minutes, when it may be set off to cool, and will be fit for use."

"*Mode of application.*—Spread the ointment on common writing paper, and bind it to the part affected, and renew the plaster every twenty-four hours."

The resemblance between this and the common Diachylon plaster will be seen by every one acquainted with pharmaceutical preparations—they are in fact essentially the same.

---

13. For a machine for *Breaking Stone and Thrashing Grain;* William H. Bell, Fortress Monroe, Virginia, and T. P. Andrews, Washington City, District of Columbia, both of the army of the United States, July 9.

A wooden frame is made to run upon truck wheels, which wheels are to be taken off when the machine is used. An upright shaft and horizontal lever, enable a horse to turn a large crown wheel in the usual manner: this crown wheel is geared into a trundle or cog wheel which gives motion to a horizontal shaft carrying wipers, or lifters, and these raise two hammers fixed much in the manner of trip hammers. The stone to be broken is put into cast iron boxes, the bottoms of which are formed of bars placed at such distances apart that the broken stone will pass between them; each hammer is to weigh 300 lbs., and it is proposed to form their faces in furrows

to correspond with the spaces between the bars, or, should this not be found to answer well, to make them rounding.

The machine is merely described, without particularizing what parts are claimed as new.

---

14. For a mode of *Preparing Oil and Spirits of Turpentine for Paint;* John J. Pendergart, Palmyra, Wayne county, New York, July 9.

This is one of those processes in the arts, which, without permission from the patentee, we shall not, at present, publish.

---

15. For a machine for *Dressing Hemp and Flax;* Abel Smith and James Olney, Westmoreland, Oneida county, New York, July 10.

This machine, like most for the same purpose, acts upon the hemp or flax altogether by fluted rollers. One roller of 20 inches in diameter is to be surrounded by 5 or 6 others of about 10 or 12 inches in diameter. The flutes to increase successively in fineness. There is nothing peculiar in the machine, nor is there any claim made. The drawing also is without written references.

---

16. For an improved *Concave Sectional Elastic Bed,* to be applied to a machine *for Thrashing Grain;* David Flagg, jr. City of New York, July 10.

The improvement claimed is here distinctly set forth, as it is confined to a particular part of the machine, which, in other respects, resembles those previously used.

The concave bed, in which the revolving beaters work, is made of pieces of plank of about two inches in thickness, placed flatwise together, and curved so as to suit the beating cylinder. The number of these pieces depends upon the length of the cylinder. They are loosely connected together by a bar of iron which passes through them, considerable play being allowed in the boring of the holes. The ends of this bar rests upon spring boxes, and each thickness of plank is separately borne up towards the beaters by spiral springs under them. Between each plank is a washer, keeping them about a quarter of an inch apart, so that they may play freely, and independently of each other.

The claim is to "the method of forming a *concave sectional elastic* bed, of from six to twelve pieces of plank, (more or less) as above specified, and each one, two, or more pieces or sectional parts of the bed, being capable of being moved to or from the beater, separately or together, as occasion may require."

---

17. For a *Machine for making Shot, and Musket and Rifle Bullets;* Julius Willard, Baltimore, Maryland, July 10.

The machinery referred to in the above title is intended to manu-

facture balls by first casting, and afterwards condensing them by rolling. Several abortive attempts have been made to manufacture bullets by pressure, so as to condense, and equalize them; the failure has not resulted from any real difficulty in accomplishing the object, but from the increase in cost. The present plan exhibits a good arrangement for the purpose, and is very distinctly described. The specification refers throughout to the drawings which accompany it, and without which no more than a general idea of the machinery can be given.

The balls are first cast in moulds consisting of two iron plates, faced so as to fit closely together. The lower plate forming one-half of the bullet, and the upper plate the other half. The thickness of the upper plate is just equal to that of the half bullet, there being a hole through it above each, for the purpose of casting.

These plates are so placed as to form an inclined plane, upon a frame made for the purpose. A hopper to contain lead to fill the moulds, is made to slide over, and in contact with the upper plate, and is followed by a knife which removes all the superfluous metal. The hopper is borne down by a weighted lever, and moved by a rack and pinion.

Upon being turned out of the moulds, the bullets are coated with black lead, to prevent their adhering, after which they are passed through the rolling machine. This consists of small hoppers, into which they are first put, and by which they are delivered on to grooved rollers, properly adapted to them; of these there are five, which they pass in succession, each with the grooves a little smaller than the preceding one; this number, it is said, is found sufficient to render the balls perfect.

The claim is to the general arrangement of the whole of the machinery.

---

18. For a *Water Elevator, for Elevating Water from Wells and Fountains;* Enoch Honeywell, Broadalbin, Montgomery county, New York, July 10.

Eight closely written pages of foolscap are occupied by the description of this machinery, which consists of the common horizontal wind mill, employed to cause an endless strap to revolve over pullies; one in the well, and the other at the point at which the water is to be discharged; buckets, or canisters, being attached to the strap, for raising the water. After the long and minute description of every part, there is no claim to any, and had we drawn the specification, this omission would have relieved us from one great difficulty, that of telling what there was new in the application.

---

19. For an improvement in *Bedsteads for the Sick;* Avery Smith, Milo, Yates county, New York, July 12.

A part of the frame of this bedstead, with the sacking bottom attached to it, is made to raise, it being provided with a hinged

frame for that purpose. The raising is to be effected by a rope passing over a pulley attached to the middle of the head rail of the tester.

In this contrivance there is no novelty; bedsteads made to raise in this way, and otherwise adapted to the purposes of invalids, are well known to physicians and surgeons.

---

20. For an improvement in *Manufacturing Cloth Composed of Flax and Wire;* Peter Laporte, Augusta county, Virginia, July 12.

This wire cloth we are told will be suitable for roofing of houses, for portmanteaus, valises, knapsacks, cartridge boxes, light boats, hammocks, bottoms of chairs, cradles, carriages for children, coverings of decks of steam boats, military caps and armour, carpeting, sacking bottoms for bedsteads, sofas and settees, pannels and roofing for carriages, baskets, water buckets, travelling trunks, carrying the mail, &c. &c. &c.

There are two things which surprise us in regard to this patent; the first is, that it should have been taken out at all, and the other that a second patent for the same thing should be obtained by the same gentleman.

By turning to page 213 of our second volume, new series, it will be seen that on the 28th of July, 1828, a patent issued to Mr. Laporte, for a cloth for the boots of stages, carpeting, sacking bottoms, &c. &c. to be composed of hemp and wire. Not the slightest allusion is made in the present instrument to the former. In both specifications it is stated that the cloth may be well covered with paint on both sides; and a specimen so painted was deposited in the patent office at the time the first patent was issued.

Had it been the design of the patentee to produce an article as unsuitable as possible for the various purposes to which he proposes to apply it, we should have deemed him eminently successful. The cloth is without elasticity; the chain and filling are as incompatible as they could well be, one being well adapted to cut the other; the wire is easily indented, takes a set, and will break by the ordinary bending backward and forward to which it is liable. There is now at the post office in this city, a specimen of a mail bag of this manufacture, which in being merely brought to the office, without the rough treatment which such bags are to meet with in actual use, exhibits strong marks of its inability to enter the service.

---

21. For a "*Double Spinner*," adapted to the common spinning frame, or throstle; Ethan Bowen, Providence, Rhode Island, July 13.

This patent is taken for an improvement on the spindle and its appendages. The yarn is to be distributed upon the bobbin by means of a ring, but not without flyers, as in Thorp's and some others. In this instrument the ring is placed on the arms of the flyer, and has notches on its opposite sides corresponding with those arms; by

which means it is caused to turn with the flyers, and is kept in its place. The top of the flyer terminates in a tube which runs in a thread rail; and the thread is distributed upon the bobbin by notched pieces of wood, or metal, which embrace the outer edge of the ring, and raise and depress it in the manner of a waive rail.

The spindle and flyer are both banded, either from the same or separate drums, so that their motions are distinct from each other, and may be varied; the flyer, for example, may be made to move faster than the spindle, to wind the yarn on the bobbin, or the spindle may be made to move faster than the flyer, for the same purpose; the difference between the motions of the flyer and spindle being sufficient to wind the yarn on the bobbin when small; but it may be increased to increase the friction of the bobbin, as the strength of the yarn may require.

The spindle may be similar to the common throstle spindle, having a step and bearing rail on which it turns.

Several modifications of the spindle, as well as of other parts, are represented; and it is observed also that the ring may be dispensed with entirely, and the yarn be distributed on the bobbin by means of a hook attached to one arm of the flyer, the spindle being made to vibrate.

The claim is to "the method of making or regulating the friction of the bobbin or spindle on which the yarn is wound. And also the method of annexing a ring to the flyer for the purpose of distributing the yarn on the bobbin or spindle. The advantages arising from them being the production of a light draft on the yarn, so that fine yarn can be made with greater facility on the common spinning frame than the common mode of using the bobbin will admit."

---

22. For a *Machine for Thrashing Wheat,* and other kinds of small grain; John Stowits, Gorham, Ontario county, New York, July 13.

Thrashing machines we usually dismiss with a brief notice, but in the present instance the ordinary arrangement is *inverted,* and as this constitutes a difference much greater than usual, we therefore publish the description entire. (See specification.)

---

23. For an improvement in the *Rail-way;* Edward Dunscombe, City of New York, July 13.

(See specification.)

---

24. For an improved *Churn;* Moses Granger, Syracuse, Onondaga county, New York, July 14.

In this churn there are two vertical shafts, each carrying dashers, and both turned by means of a crank and cog-wheel above, in a way which we have more than once described. No claim is made to this part, the improvement consisting of a partition, crossing the middle

of the churn, to prevent the cream from acquiring a rotary motion. This partition is notched to allow the dashers, or wings, to pass.

---

25. For a *Machine for Cross Cutting, Sawing up, and Slitting Wood;* Aaron H. Foot, Amboy, Oswego county, New York, July 14.

The description of this machine is about as defective as it is possible for such an instrument to be; the drawing, however, is very well executed, and, with the references to it, serves to give a sufficiently clear idea of the construction and operation of the machinery. A square frame is made, and this is to stand upon the log which is to be cross cut, it being furnished with hooks, to fasten it on, in the manner of the dogs of a saw mill carriage. Two upright posts are mortised one in each side of the frame, and between them the circular saw, and the wheels and pinions by which it is to be moved, are situated. A separate frame slides up and down between these uprights, like a saw frame between its fender posts. The gudgeons of the circular saw, those of the toothed wheels and pinions to which it is geared, and of the crank by which they are turned, all work in this sliding frame; the circular saw being at the lower end, and running vertically.

When the frame is fixed upon the log, the saw touches it, and when put in motion by means of the crank, cuts into it, descending by the weight of the sliding frame, and the contained wheels, until it has cut through, when the sliding frame, with its machinery, is raised up by racks and pinions.

This certainly is a very complex, and, we think, a very unpromising machine; but as among the other omissions of the specification, the patentee has neglected to make any claim, we think it unnecessary to animadvert upon its merits.

---

26. For a *Rotary Pump,* to be used for the raising or forcing water and other liquids; Ebenezer R. Hale, Hyde Park, Dutchess county, New York, July 14.

(See specification.)

---

27. For a machine for *Stamping Brass, Copper, Tin, Iron, and other Malleable Metal;* Jacob Stroop, Landisburg, Perry county, Pennsylvania, July 17.

What difference there is between this and the ordinary stamping machine used in the manufactories for cabinet furniture, and for many other purposes, the patentee has not told us. These stamping machines are usually constructed upon the principle of the pile driving machine, and such is the case in the present instance. In these instruments a rope has usually been employed to raise the weight, but for this the patentee has substituted a rack and pinion.

When we learn what are the claims of the patentee, we will com-

municate this information to our readers; at present we are without data.

---

28. For an improvement in the *Rolling Mill, for Middling and Edging Spring Steel for Carriage Springs;* George Stoudinger, Newark, New Jersey, July 17.

The rollers of this mill are so formed as to edge the steel and to shape the middle in the way required for carriage springs. In the principle of the machinery there is not the slightest novelty. We do not know that *carriage springs* have been prepared in this way; but an almost infinite variety of other articles have been so formed. The only claim, therefore, that could be made in the present instance, would be to the particular application of it to springs; a claim of doubtful validity, and not made by the patentee.

---

29. For the *Application of Steam in the Art of Making Soap;* Bernard Zell and James Doyle, Baltimore, Maryland, July 19.

There is no novelty whatever in the apparatus described in this specification, nor do the patentees make any pretension of the kind. Tubes from a boiler conduct the steam into tubs, or vats, containing the ordinary materials for making soap. Another tub is added which contains tallow, and which is to be kept in a melted state by the steam, for the purpose of making candles: this, however, is not alluded to in the claim, which is to "the application of steam to making soap, and the vessels and machinery herein described and specified for that purpose."

The latter part of the foregoing claim is fraught with danger, for the reason already given; and the former part does not, we apprehend, stand upon the most secure basis. In the manufacture of sugar, and of various other articles, vaporization has been effected by the application of steam; and although many patents have issued for the boiling of sugar in this way, they have all been for the structure of the apparatus employed, no one among the patentees having broadly claimed the application of steam, which is now as familiar as the application of heat by a naked fire.

---

30. For a *Machine for Thrashing Grain;* Amos Lupton and John Lupton, of Frederick county, and Jacob Janney, of Loudon county, Virginia, July 28.

"The improvements as here claimed are the cylinder of beaters as before described, and the cast iron fluted ribs as placed in front of these beaters." As the construction of the individual parts, and the arrangement of the whole machine are such as to give it the appearance of being a twin brother to some which we have previously seen and described, all further notice would be superfluous.

LIST OF PATENTS FOR AUGUST.

1. For an improvement in the mode of *Making Paper* for writing, printing, wrapping, and boards, *from wood;* Lewis Wooster and Joseph E. Holmes, Meadville, Crawford county, Pennsylvania, August 3.

(See specification.)

---

2. For an improvement in the *Mode of Making and Manufacturing of Crackers, Ship, Pilot, or Navy Bread, or Biscuit,* by means of which one or more may be cut, pressed, dotted, stamped, and finished, by and at the same operation; being a rectangular machine, and called the "Franklin Cracker Machine;" Nathan Daskam and David G. Wood, Geneva, Ontario county, New York, August 5.

We are informed in the specification that "this improvement in the making and manufacturing of crackers saves manual labour, and enables two persons to make as many in one day as ten men can in the same length of time by the common operation, and the crackers are of a superior quality, and uniform as to appearance."

The specification consists entirely of references to the drawings which accompany it. There is no claim made; the whole machine, therefore, must be new, or the patent will not stand the test in a court of law.

The dough is placed upon a table which is carried backward and forward between rollers; on the bottom part of the frame there are dockers, which dock, cut, and stamp the cracker.

Without a plate of the machinery the operation of it could not be clearly described.

---

3. For an improvement in the *Manufacturing of Paper* by means of a machine called a "Pulp Dresser;" Elihu H. Thomas and Nathan Woodcock, Brattleborough, Windham county, Vermont, August 11.

(See specification.)

---

4. For an improvement in the art of *Cutting and Casting Music Type;* George B. Lothian, City of New York, August 11.

(See specification.)

---

5. For an improvement in the *Manufacture of Margaric, Stearic, and Oleic Acids,* by the use of caustic lime in the decomposition of the margarate, stearate, and oleate of potash; Henry Seybert and Lardner Vanuxem, Philadelphia, Pennsylvania, August 16.

The specification of this patent will be hereafter given.

6. For an improvement in the *Machine for Making Ropes, Cordage, and Twine;* Samuel F. Dexter and Samuel Graves, Auburn, Cayuga county, New York, August 24.

Several machines have been invented for doubling and twisting cordage, without the necessity of employing long rope walks; for the smaller kinds of cordage some of these machines have answered a good purpose, but we are not aware that the attempts to apply them in the manufacture of large ropes have been successful. From the complex nature of such machines their structure cannot be shown without drawings; and their relative worth can be told only by their practical application. The arrangement of the parts of the present machine differs from those with which we have previously been acquainted; it is minutely described, and its supposed advantages dwelt upon at large; there, however, is no claim, either general or particular.

---

7. For an improvement in the *Machine for Clearing and Deepening Rivers,* called the "Floating Excavator;" William Morrison and George Tomb, Jersey Shore, Lycoming county, Pennsylvania, August 25.

Two boats are to be made, somewhat in the form of scows. They are each to be about 60 feet in length, and connected together by timbers passing from gunwale to gunwale. The scoop by which the excavating is to be effected, works between the boats. One of the vessels must be of sufficient width to allow of a circular walk for a horse; the other need not be more than half that width. A capstan is placed in the centre of the larger boat, and from this a lever, or sweep, projects, to which a horse is to be attached to turn the capstan. The rope, or chain, which winds round the barrel of this capstan, is attached either to a harrow, or to a scraper, as the case may be. When the earth or gravel requires to be loosened, the harrow is employed, and afterwards the scraper, to remove it. The handles of these instruments are to slide upon the timbers which connect the two boats, and are to be guided by four men. The harrow and scraper, it is said, will work in water from one to six feet in depth, and one horse, with five men, will excavate from 60 to 70 cubic yards per day. The boats lie across the stream, and are to be securely moored.

We have in the specification no information of the mode in which the dirt is to be removed from the scraper; and on some other points of equal importance it is altogether silent; nor are we informed in what part of the machinery the novelty consists, as the whole is merely described, without any thing in the nature of a claim being preferred.

PATENT FOR SEPTEMBER.

For a *Machine for Cutting Biscuit, Crackers, Cakes, Pilot and Navy Bread;* Joseph Clark and Henry Henderson, Baltimore, Maryland, September 13.

The dough to be made into biscuits is put into a hopper, whence it is delivered between two rollers; these roll it to the proper thickness, and spread it upon a sliding board; this board is made to advance with the proper degree of speed. From a whirl, attached to one of the rollers, a band extends to the opposite end of the bench or frame, in which the sliding board works, and is made to turn a crank shaft; a pitman, or connecting rod, passes up from the crank, to one end of a lever, working like a scale beam. At the opposite end of this lever is a rod, which is worked up and down by the vibrations of the lever; and on the lower end of the rod is screwed the cutter and prickers, cast in one piece, and of the size and form desired.

The sliding board is made to advance by means of notches along its side in the manner of a rack, into which a catch, or feed arm works, this feed arm being operated upon by the same crank, which causes the lever to vibrate. The advance at each thrust of the feed arm, is equal to the diameter of the biscuit to be cut.

The claim is to the "machine for cutting biscuit, crackers, pilot and navy bread, &c. as before described, except the rollers and hopper, and the form of the cutters; but we claim the mode of casting the cutters, prickers, and plate of metal, in one piece."

We think this claim both indefinite and insecure; indefinite in claiming the machine "as before described;" and insecure in afterwards apparently limiting it to the cutter, &c. "in one piece," as the cutters, &c. may very readily be made in several pieces, and securely joined together. The casting in one piece may be the cheapest mode, we much doubt its being the best.

Note.—It will be seen that only seven patents were issued in the month of August; and in September, but one. This was in consequence of the absence of the President from the seat of government, his signature being necessary to the validity of a patent.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for an improvement in the ordinary machine for Thrashing Wheat, and other small grain. Granted to JOHN STOWITS, *Gorham, Ontario county, New York, July* 13, 1830.

THE improvement consists in a variation from the thrashing machines now used, in this respect; those now in use are fed near the bottom of the machine, and are so constructed that the main cylinder catches the straw at the *lowest point* in its revolution, and, of course, throws the straw, grain and chaff upwards; they then fall together in a confused mass; this renders it very troublesome to the person employed in separating the refuse from the grain, and while the machine is in motion the place he must occupy is filled with dust; the velocity of these machines is such, and their power so great, that grain, and even stones, sticks and weeds, will greatly annoy, and sometimes injure, the person so employed.

By this improvement all these objections are avoided; a concave piece of wood, filled with teeth of proper size, is placed at the *top* of the machine, and the cylinder also filled with teeth plays into this, and the straw to be thrashed is put on an apron leading to the top of the cylinder—the course of the straw is therefore downward, and it falls on a sieve. A blower in the lower part of the machine, fixed as in the ordinary fanning mills, separates the refuse from the grain. The straws of ordinary length, by the force which they acquire in the revolution, are thrown beyond the main body of the grain.

JOHN STOWITS.

Specification of a patent for an improvement in the Rail-way, intended to be applied to the loading and discharging of vessels, of coal, and merchandise of all descriptions, and the transportation of goods from place to place. Granted to EDWARD DUNSCOMB, *of the City of New York, July* 13, 1830.

THIS new and valuable improvement consists in elevating the rail-way in such manner that coal may be swung underneath it (by means of a chain attached to the bottom of the rail carriage) and may be thus transported with facility to the place of deposit.

The rail-way is sustained in a level and horizontal position, and at the required height, by a suitable number of upright posts, and is permanently secured by bolts or other suitable fixture, to them. The lower extremities of these posts are securely imbedded in the ground, and are preserved in their respective positions by means of suitable braces or stancheons.

On the surfaces of the horizontal bars which constitute the bed pieces of the rail-way, are beds of wrought or cast iron, or other proper material, which are firmly secured to them, and extend their whole length. These beds are made perfectly smooth and level, to receive the wheels of the carriage, which may be flanched or grooved to move upon them.

The rail carriage consists of a frame constructed of suitable material, to which axles of wrought iron are attached by means of bolts or other contrivance. The wheels may be formed of wrought, or cast iron, or other proper substances, and may be made solid or otherwise, with their surfaces either flanched or grooved to move on the beds of the rail-way, as before mentioned. There is attached to the bottom of the rail carriage, and suspended from it, a chain which may be lengthened or shortened at pleasure, having a hook at its termination or extremity for attaching a coal tub.

At one extremity of the rail-way, and projecting above it, a crane is placed, and secured by suitable fixtures. This crane is supplied with a chain or rope fall, which is used for raising the coal to the carriages, from the vessel, or other place of deposit, and may be worked by horse or other power.

There is constructed, beneath the rail-way, and directly under

the crane, a staying which is made to slide between the foot, and may be raised or depressed at pleasure by means of pins or bolts, which are adapted to apertures bored in the posts.

The coal is raised to the staging, before mentioned, in tubs, by means of the chain fall, attached to the crane, where it is disengaged by an assistant, and transferred to the carriage, the chain and hook of which hang directly over the staging.

The carriage is set in motion by means of ropes and pullies, or other machinery, and the coal, suspended in tubs beneath, is transported to the distance, or place required, where it is deposited; the carriage immediately returning with the empty tub.

The subscriber claims the privilege of constructing his improved rail-way of a double form, so as to admit of two carriages moving parallel to each other; in which case the middle or centre horizontal bar, or bed piece, has, on its surface, beds for the inner wheels of both carriages, on which they move, as before mentioned. The crane in this case is placed in the centre, and is enabled to serve each carriage in succession by swinging two ways.

He also claims the sole privilege of applying his improved railway to the loading and discharging vessels of coal, and merchandise of all descriptions, and transportation of goods from place to place.

E. DUNSCOMB.

Specification of a patent for a Rotary Pump, to be used for the raising or forcing of water and other liquids. Granted to EBENEZER R. HALE *and* CHARLES LAZAREME BELL, *of Hyde Park, Dutchess county, New York, July* 14, 1830.

Two wheels are constructed, one of them having, on its periphery, floats or wings, three in number, (more or less) at equal distances apart, and something in the form of cogs; the other said wheel having a cavity, or cavities, (depending upon its size) in its periphery, into which cavity or cavities may fall the wings or floats of the wheel afore mentioned, they being placed in a manner to revolve together, and when so placed, their peripheries are intended to come in close contact, so as to form a water joint.

The above described floats are an inch and a half in length, and three in breadth, (more or less,) or the thickness of the wheel, or hub, on which they are; which thickness, as well as the length of the floats, should be in proportion to the diameter of the wheel on which they are, and the quantity of water, &c. they are intended to raise or force.

The two above described wheels are enclosed in a casing corresponding with the size of the wheels, which casing fits closely upon the sides of the wheels, and upon the periphery of the one having the cavity or cavities as aforesaid, and equally close on the outer extremity of each wing, or float, in each and every part forming water joints; to effect which it may be packed with leather, or other suitable

material, in such places as may be found necessary. Through the ends, or heads, of the above described casing, pass the shafts which support the two wheels before specified, on, and with which they are made to revolve.

The gudgeon boxes are made in such a manner as to admit of packing, which packing generally consists of cork. Upon the shafts just mentioned, and on the ends which project through the end, or head of the casing, are toothed wheels; they are of such size as will cause the wheels within the casing to revolve in such a manner as to bring the floats of the one into the cavity, or cavities, of the other, which said fronts are fitted, or packed, so as to form a water joint while revolving and within the cavity or cavities of the wheel afore mentioned. To the casing which contains the wheels, and on or near to the periphery of the same, are two passages or apertures, to each of which a pipe may be attached, one for the supply, and the other for the discharge of water, &c.; the passages to which are the pipes, enter the casing as near as is convenient to the wheel within, having in it the cavity or cavities aforesaid, one of them being upon each side of the same; or the place for the discharge may be varied, provided it be placed from the supply passage a distance not less than the space between two floats or wings. The pump may be put in motion by hand or other power; the water, &c. is drawn in by suction, produced by the motion of the floats as they recede from the wheel in which is the cavity or cavities: it is discharged in like manner by their motion as they approach the discharge passage. This pump is subject to variations: it may have two places for supply, and two for the discharge: this may be done by placing another wheel having in it a cavity or cavities similar to the one above specified, on the opposite side of the wheel, upon which are the floats, and gearing it with that wheel in such a manner as to give to it the necessary motion for bringing the wings, or floats, of the one, into the cavity or cavities of the other. The above specified floats, or wings, may be attached to the wheel by forming a notch, or mortise, in the wheel from the periphery, in a line to the centre, of the same thickness of the float, and one inch in length (more or less:) in this notch, or mortise, is placed one end of the float, leaving the other end projecting a suitable distance from the periphery of the wheel. A *screw and nut*, or a *wedge*, or *spring*, is also fixed in the bottom of the said mortise, or notch, for throwing the wings, or floats, out from the wheel, as occasion may require, for the purpose of keeping a close joint between them and the casing.

That which I claim as my invention and improvement, is, having the floats which project from the periphery of the wheel, and which act as buckets, *stationary*. And also the application of the revolving block, or wheel, in which is the cavity or cavities to the rotary pump; the placing and revolving these wheels together, as above specified, for the above mentioned purposes.

EBENEZER R. HALE.
CHARLES LAZAREME BELL.

Section of Hale and Bell's Rotary Engine for Pumping, &c.

A, the wheel having upon its periphery, floats, or wings.

B, small wheel, having in it a cavity or cavities to receive the floats.

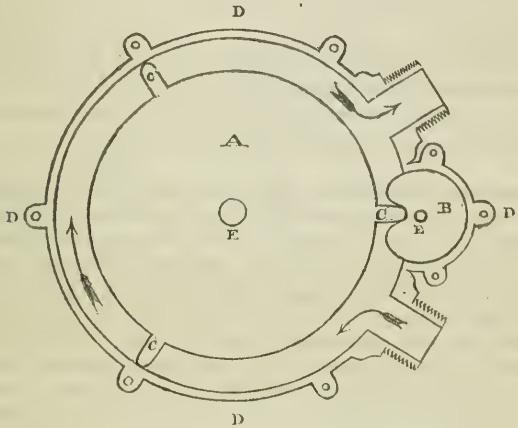
C, C, C, the floats, wings, or fans.

D, D, D, the casing which encloses the wheels.

E, E, the shafts or axles.

The passages for the supply and discharge of water, are shown by the bent arrows.

The axes of A and B are connected together by toothed wheels on the outside of the box, or case, to insure the passing of the floats into the cavity in C.



Specification of a patent for an improvement in the mode of making Paper for Writing, Printing, Wrapping, and Boards, from Wood. Granted to LEWIS WOOSTER *and* JOSEPH E. HOLMES, *Meadville, Crawford county, Pennsylvania, August* 3, 1830.

BE it known that we, the said Lewis Wooster and Joseph E. Holmes, have invented, constructed, made and applied to use, a new and useful improvement in making or manufacturing paper for writing, printing, wrapping, and boards, from wood; the preparation of which, for making the paper in the common paper mill, is as follows, viz. The wood is reduced to shavings of the ordinary jack-plane shaving size, or bruised so as to be rendered of nearly the same size of the shaving; they are then placed in a cistern, or boiler, of sufficient dimensions, and covered with water, which is put to a boiling heat. To every one hundred pounds of the wood (thus reduced) put from twelve to eighteen pounds of alkali, either vegetable or mineral, in proportion to its quality for strength. If salts are used,

they should be reduced before they are placed on the wood in the cistern, or boiler, with the water; they may, however, be put in with the water and wood before reduction, but the first mode is found the most preferable. Should lime be used, there must be a sufficient quantity in all cases to equal twelve pounds of pure black salts. For every one hundred pounds of wood, which may be leached before being placed in the cistern with the wood and water, or thrown in, in its pure state. One hundred pounds of wood, will, if well attended to, make from five to seven reams of paper.

LEWIS WOOSTER.
JOSEPH E. HOLMES.

Specification of a patent for an improvement in the manufacture of Paper, by means of a machine called a "Pulp Dresser." Granted to ELIHU H. THOMAS *and* NATHAN WOODCOCK, *Brattleborough, Windham county, Vermont, August* 11, 1830.

THIS improvement consists of a box about two feet square and one foot deep. Inside of the box, near the bottom, is placed a *hog*, or *float wheel*, or agitator, about 7 inches in diameter, and as long as will play freely inside of the box. One end of the hog shaft passes through one side of the box, and receives a pulley which is connected with some moving power, so that a rapid motion is given to the hog. Directly on one side, and nearly over the hog, is placed a sieve or screen, on an angle of about 45 degrees, with apertures so fine that knots and other offensive particles cannot pass through; but with the agitation caused by the hog, the pulp is allowed to pass freely when diluted with water.

A partition of board is placed on the opposite side of the hog, much like the screen; the tops of the screen and partition are united together when in use, in such a manner as the pulp shall not get through between them. The partition reaches within about two inches of the bottom of the box; the pulp flows in at one end of the box, and passes under the partition, is then washed through the sieve or screen, and flows out at the opposite end of the box through an aperture.

The sieve, or screen, is made of triangular bars of metal, about one-fourth of an inch in width on each angle; these bars are made straight and true, and placed near enough to each other to prevent coarse particles passing through the apertures.

These bars may be made circular, and placed perpendicularly or horizontally, with a revolving or vibrating hog, which we conceive to be our principle.

We do not claim as our invention, the hog, or agitator, for mixing and giving motion to pulp in the manufacture of paper, nor of the common engine for grinding rags into pulp. But we claim the discovery of applying the hog and common engine to the purpose of

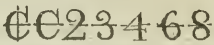
forcing the pulp through the apertures of a screen or sieve, for the purpose of separating knots and filth from the pulp.

ELIHU H. THOMAS.
NATHAN WOODCOCK.

Specification of a patent for an improvement in the art of Cutting and Casting Music Type. Granted to GEORGE B. LOTHIAN, *City of New York, August* 11, 1830.

THE staff lines are fitted on single bodies, and dress up to the face on the extreme edge of the body, leaving no shoulder.

What I claim as new, and my own invention and discovery in the above described type, and for the use of which I ask an exclusive privilege, is:

In cutting and casting but one staff line on the time marks, thus;  they are, therefore, as readily made to line as a plain staff line. The type thus cast projects nearly one-half over the body, and fits on to the plain staff lines, above and below.

In cutting and casting the angular quavers without any projection over the body, and a line, thus —, or an angle thus, ⌐ or thus ¬, is cast on a body equal to an entire quadrate, or half the size of the body of the staff lines, which is placed in the composing stick first, and then the quaver on it, which causes the quaver to run on the next line below, thus. 

An *en* quadrate or character on the half body is placed next in the composing stick, and makes up the two lines.

The notes in the lines are made in the common manner; as also seconds, thirds, and choosing notes, and make perfect joinings in the stems of the notes, without kerning, or projecting over the body. The slurs are cut and cast in the spaces of the staff, and come on the body without projecting.

This improvement reduces the number of sorts in a fount, and facilitates the manufacture.

GEORGE B. LOTHIAN.

Observations on the Paddle Wheels invented by MR. PERKINS, *and those patented by* MR. BENJAMIN M. SMITH, *of Rochester, New York, November* 20*th*, 1829. *In a letter from* MR. J. DOOLITTLE, *of Bennington, Vermont. To which are subjoined some remarks by the* EDITOR, *and the specification of* MR. SMITH'S *patent.*

To W. Hamilton, Esq. Actuary of the Franklin Institute, Philadelphia.

Bennington, Vermont, August 4th, 1830.

MY DEAR SIR,—You know how much I admire the general spirit of frankness, candour, and judiciousness, which characterizes Dr. Jones' remarks on the multitude of pretended inventions which throng

the patent office. And I should be exceedingly loth to ascribe to him any thing like a bias in favour of the inventions of particular individuals, without regard to the merits of the inventions themselves.

I am led to these remarks by the following circumstances.

Some three or four days after I received the June number (No. 6, vol. v.) of the Journal of the Franklin Institute, I left Bennington on an excursion to the west. On Saturday evening, 10th July, being at Syracuse, I saw a steam boat arrive, on the canal, from the west. Some gentlemen present, who had already seen that boat, observed that her machinery was of an unusual construction. I immediately went to the quay, and in the few minutes the boat remained, got into conversation with the person whom I was led to believe was the inventor; he invited me on board to examine the machinery. I had only time to see the wheels, and you may judge of my surprise when I found that, in the inclination of the buckets, and in the angle which the axes of the wheels formed with the plane of the keel, they were exact *fac similes*, or rather, perhaps, exact prototypes (for they were probably made first) of the wheels invented by Mr. Jacob Perkins, and described in the above number of the Journal. The gentleman above alluded to informed me that the specification for these wheels had been sent to Washington in November, 1828, and a patent obtained in November, 1829.

On my return home, I sought in vain among the notices of patents, for some indications which should, at least, lead to the discovery of the name of the author or inventor, and it was not until yesterday, that I learned, by a letter from a friend at Syracuse, that it is Mr. Benjamin M. Smith, of Rochester, Monroe county, New York. On recurring to the Journal, with these data before me, I find at page 136, vol. v. that Mr. Benjamin M. Smith did obtain a patent on the 20th of November, 1829, (ten days prior to the date of Mr. Perkins' patent.) There is nothing, however, in the editor's notice of Smith's patent which can induce the belief that he thinks the invention entitled to the least consideration, or respect; on the contrary, he says, "wheels of the above kind have been patented, tried, and abandoned, long since," while, in speaking of an exactly similar contrivance by Mr. Perkins, he says, page 385, same volume, "should the advantage produced by the present paddle wheel be, in its amount, but one-half equal to the ingenuity manifested in its construction, we think it will be the best, by far, which has yet been proposed."

I have not the honour of a personal acquaintance with Mr. Perkins, though I have long known him by reputation, and feel a high respect for his mechanical talents. Of Mr. Smith I have never heard until now; but, it seems to me that, if an invention is to be judged of by the intrinsic merits, either of its ingenuity or its usefulness, the same thing which in one case could call forth such unqualified encomiums, ought, in another, to command, at least, a small share of courtesy, even though its production should not be accompanied by a name already resplendent with distinguished honours.

As I am unwilling to suspect Dr. Jones of either intentional injustice or undue partiality, I must suppose that either the drawings

or the specification, or perhaps both, were so defective that he could not derive from them a correct understanding of Mr. Smith's invention. But, however this may be, I beg leave to repeat that the two inventions, (though no doubt both *original*) are exactly similar in every respect. The boat I saw is called the "Novelty," and her wheels are fixed in the stern.

I beg you will attribute this intrusion to its true motive—my love of truth and justice.

I am, sir, very respectfully, your obedient servant,

J. Doolittle.

Remarks by the Editor.—Although the above letter is dated in August last, it has but just come into the hands of the Editor, or it would have received an earlier notice. We have not the temperament which will admit of our sitting at ease under the grave charge of partiality, from an intelligent correspondent, who is actuated only, as we really believe, by the "love of truth and justice;" we are prompt either to correct our mistakes, or to repel an unworthy insinuation, or a false charge. Whether the animadversions made in this Journal, have been tinctured with partiality, let some of our friends tell, whose inventions have passed under review; and whether such has been the fact in the case before us, will soon appear.

We are far from Syracuse, and far from the boat which Mr. Smith had put into actual operation, but we have the testimony of Mr. Doolittle, and the patents of Mr. Perkins and of Mr. Smith before us, and will place them before our readers, when it will plainly appear that either Mr. Doolittle saw "what is not to be seen" in the angles of the buckets and shafts of Mr. Smith's wheel, or the latter gentleman, finding that his "*smoke jack*" wheel must take its place among those which had "been patented, tried, and abandoned," had determined to essay that, upon the *ingenuity* of which we had passed "unqualified encomiums." We believe the latter to be the case. That our readers may see the grounds of our belief, we now give his specification, and a cut from the drawing which accompanies it.

Specification of a patent for a new and useful mode of Propelling Boats in the Water, by the application of Sculling Wheels, *or screw propelling wheels. Granted to* Benjamin M. Smith, *of Rochester, Monroe county, New York, November 20th,* 1829.

Be it known that I, Benjamin M. Smith, have invented a new and useful mode of propelling boats in the water, by the application of sculling wheels, or screw propelling wheels to the boat, and that the following is a full and exact description of the mode in which the boats are propelled, as invented by me.

I make wheels (to the discovery of which I lay no claim, and) which are thus described. Any number of paddles, in shape resembling an open fan (as may be seen by the annexed drawing) and

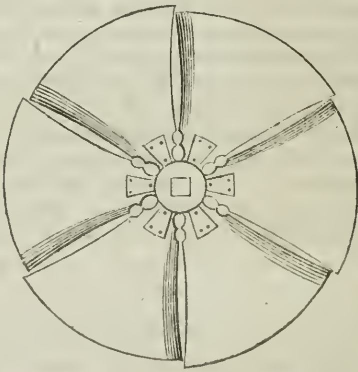
of any length and width, are fastened at the tapered end to a centre block, or hub. These paddles are set oblique from the centre block, at any angle wished, and are set regular, so that the upper extreme points of the paddles would all fall in the circumference of the same circular plane, and all the lower, or opposite extreme points of the paddles would also fall in the circumference of a circular plane parallel to the first named. The distance between these two supposed circular planes would be according to the obliquity and width of the paddles, and the outer ends of the paddles would coincide with the threads of a screw.

The whole wheels are best constructed of iron, but may be of any hard suitable material, and when completed, are like the wheel usually denominated a *smoke jack.* Two of these wheels may be fastened at the stern or bow of the boat, placed perpendicular, or horizontal, with a shaft running from the centre of the wheel, and may be worked by horses, steam, or any other power. The wheels work best when they revolve contrary ways from each other, so as to throw in the water towards each other, and prevent the washing of canal banks.

Any number of wheels may be applied to a boat.

What I claim as new, and as my own invention, is the application of wheels of this description to propelling boats in the manner described; they never before having been used for that purpose.

Benjamin M. Smith.



Is this the wheel, courteous reader, "that in the inclination of the buckets, and in the angle which the axes of the wheels formed with the plane of the keel, are exact *fac similes*, or rather, perhaps, exact PROTOTYPES of the wheels invented by Mr. Jacob Perkins?" Will any one with a grain of mechanical knowledge, and half a grain of candour, pretend that there is any similarity between them? We venture to predict that Mr. Doolittle will not, and that he will confess that Mr. Smith deceived him, in declaring that his patent embraced such wheels. Look at the above cut, a *fac simile* of Mr. Smith's drawing; it is truly, as he denominates it, a "smoke jack" wheel. In Mr. Perkins' wheel there is nothing of the screw prin-

ciple, or any thing which approaches it; the paddle can be set at one angle only, and the shafts at the same angle, or its whole principle is violated. In Mr. Smith's you may set them at "any angle wished," and the shafts at no angle at all, so far as the description informs us.

The wheels, Mr. Smith says, may be placed perpendicular or horizontal; this we do not understand, even as regards the "smoke jack" wheel, but know that it cannot apply to that of Mr. Perkins. The specification of Mr. Smith's patent is certainly not given "in such full, clear, and exact terms, as to distinguish the same from all other things before known, and to enable any person skilled in the art of which it is a branch, to make, and use the same" (Act of 93, Sec. 3,) but it is sufficiently described to show that it is not what Mr. Doolittle supposes. We passed over Mr. Smith's patent with but few remarks, because we thought lightly of it. We did not animadvert upon his claim, because we believed that if it amounted to but little, it still might include all that there was of novelty, or merit, in the contrivance; and we are fully convinced that if he has met with any experimental success, it is because he has changed his plan. We wish Mr. Doolittle to take the foregoing specification, and to find out from it what is intended by "the application of wheels of this description, to propelling boats in the manner described."

In conclusion, we have no doubt, as we have already intimated, that Mr. Doolittle's letter was dictated by honest indignation at the supposed neglect with which one had been treated, who appeared to him to be a man of merit, and we honour his motive. If he thinks that we have given unnecessary strength to some of our observations, we find our apology in his letter, which, by implication, intimates that we had been unjust, or illiberal. If he views the account as squared, so do we, and we leave off as we commenced, good friends.

ENGLISH PATENTS.

To Thomas Bulkeley, *Doctor of Medicine, for a method of making or manufacturing Candles.* Dated January 6, 1830.

This invention is stated to consist, first, in a method of making wax candles by melting the material and pouring it into moulds, instead of by the ordinary method of rolling. The moulds are to be the same as those employed in the manufacture of tallow candles, but as there is a difficulty attending the expulsion of the candles when cold, a circular piece of wood with a cavity in its centre is directed to be placed at the bottom of the mould, when the other end being gently tapped by a mallet, the candle will, by degrees, be driven out. And here we may remark that the patentee appears to have adopted every means in his power to guard against any charge of obscurity in the framing of his specification, having even had the foresight to furnish us with a full sized representation of a *mallet.*

The second improvement is in forming around candles a coating

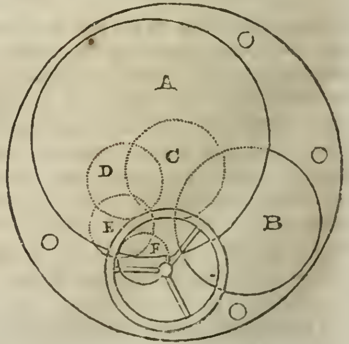
of wax, or other composition, which requires a higher degree of temperature to melt it than the substance of which the interior is formed; by which means it is affirmed that a cheap candle is obtained, having the appearance of wax or composition, in which the liability to gutter is prevented. The mode in which Dr. Bulkeley proposes to manufacture these candles is by pouring the wax or composition intended to form the coating, when in a fluid state from heat, into common metal moulds; and after allowing it to remain such a time as will admit of the congealing of a portion, the remainder of the wax, which will be that in the centre of the candle, is then poured off, and tallow substituted in its stead. The patentee observes, that an excellent candle may be produced by filling the casing with oil, in lieu of tallow; but in this instance it will not admit of being moved from place to place when in use.

The third claim in this patent is for an improved wick, by which, it is stated, a great saving will be effected in the material usually employed for that purpose. It is formed of a thin cord or thread passed through the centre of the candle, and through a small piece of straw about half an inch in length, around which is attached some common cotton wick of a similar size; the thread will be consumed as the wick burns, and the latter will slide down and prevent the necessity of snuffing. [*Rep. Pat. Inven.*

To ROBERT WESTWOOD, *Watchmaker, for certain improvements in Watches and Timekeepers.* Dated September 23, 1829.

I, THE said Robert Westwood, do hereby declare that the nature of my said invention, and the manner in which the same is to be performed, is described and ascertained in the annexed diagrams, and the following explanations thereof. As the individual parts composing a watch movement are already well known and in use, I shall only describe the manner in which they are arranged and combined in my patent watches and timekeepers, which is as follows, (that is to say:—)

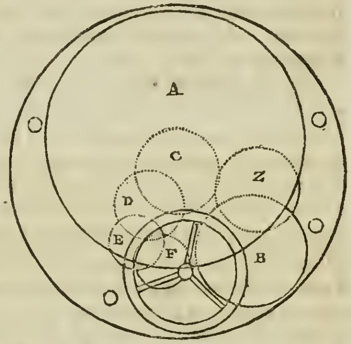
Fig. 1.



The frame consists of two circular plates, united by pillars, in the usual manner. Fig. 1, represents the pillar plate on which the calliper is drawn. The circle, A, represents the barrel; it occupies more than two-thirds of the diameter of the frame and the usual height between the plates, and what is usually termed a going barrel, having teeth on its edge, and constituting the first or great wheel. The circles C, D, and E, represent three wheels and pinions, usually denominated

in thirty hour movements, the centre, the third, and the fourth, from which they do not differ, as far as regards their uses: and the circle, F, represents the escapement wheel and pinion. These wheels and pinions are placed under the barrel, that is to say, between it and the dial plate, in cavities formed in the pillar plate, with cocks or bars to receive their pivots, the space between them and the upper plate being occupied by the barrel. The motion is communicated from the barrel to the wheels under it by means of an intervening wheel and pinion, represented by the circle, B. The teeth on the edge of the barrel act in the pinion B; and the wheel B, which is sunk, acts in the centre pinion. By referring to the diagram, Fig. 1, it will be seen that the diameter of the wheel B extends from its proper depth in the centre pinion to the edge of the plate; and as it cannot be placed at a greater distance from the centre of the barrel, it therefore limits the size of the barrel; but by introducing an additional wheel to communicate the motion from the wheel B to the centre wheel, there will be room for a barrel of still larger dimensions. Fig. 2, represents a calliper of a movement with the additional wheel, and a barrel of more than three-fourths of the diameter of the frame; the wheel B, (which is smaller in diameter than in Fig. 1,) acts in the pinion of the additional wheel, represented by the circle Z; and the wheel Z acts in the teeth of the centre wheel, which has no pinion, only a plain arbor. The additional wheel being under the barrel, is sunk, with its pinions in the same manner as the centre, third, and fourth, before described. The relative velocities of the centre wheel and barrel are the same in both callipers, namely, sixty-four to one. The ratios of the intermediate wheels and pinions may be varied without any material consequence. The upper plate receives the pivots of the barrel, arbor, and the pinion B, in both callipers, in the usual manner; and it also bears the jewelled cock in which the balance pivot acts. The points upon which I ground my right of exclusive privilege to the above invention and improvements under my aforesaid recited patent, are, the arrangement of the wheels and pinions, as far as regards their being placed so as to act under the barrel, that is to say, between it and the dial plate as before described and shown in the annexed diagrams, thereby admitting within the limits of a pocket watch of the usual size, a maintaining power of sufficient strength, with one winding up, to keep up a vigorous motion in the balance for the space of eight days, or for a longer period if required.

Fig. 2.



Observations by the Patentee.—The above invention is applicable

to all horological machines, wherein a strong maintaining power is required within a small compass; and is suited particularly to pocket watches, in order that they may require winding up only once a week.

The failure of all former attempts to make eight day watches, has been chiefly attributable to a deficiency in the maintaining power; but this defect is completely obviated by the above invention; so much so, indeed, that the eight day watches, on this construction, will be found to perform as well as the best thirty hour watches, while they have the additional advantage of not requiring the daily attention of the wearer to wind them up. [*Ib.*

To Robert Busk, *Gentleman, for certain improvements in apparatus used for Distilling.* Dated January 26, 1830.

The patentee states his object to be to cause the vapour proceeding from the still to pass several times in succession, both under, through, and over the surface of the liquid to be distilled, without mingling with it.

The apparatus consists of six horizontal chambers, all of which are furnished with communication and overflow pipes, the latter being placed near the upper part to regulate the quantity, and to leave a continual space or passage for the vapour. The cylindrical chamber immediately over the still is so constructed as to fit on the top of the latter, the neck passing through the bottom and emitting the vapour over the surface of the fluid contained in the chamber. The three chambers, placed successively over the one last described, and a small distance apart, have false bottoms, into which the communication pipes enter alternately at contrary sides; and similar pipes convey the vapour through the liquid to the space formed in the upper part of the chamber by the overflow pipes before mentioned.

The two uppermost cylinders are of much smaller dimensions, being intended for the vapour only, and having open vessels around them, into which cold water is admitted for the purpose of condensation. A long vertical cylinder, which the patentee terms the central chamber, passes through the centre of the five upper ones, and is firmly affixed to the outside or upper part of that attached to the still. A pipe, from the vat containing the wash, passes into this central chamber, and fills the remainder of the vessels, as also the still, by means of an overflow pipe in the form of a siphon, which acts when the liquid arrives at a certain point. Thus, when the operation of distillation is commenced, the vapour, by means of the communication and overflow pipes, and the false bottoms of the three chambers, is caused to pass alternately through, and over, the surfaces of the liquid contained in each vessel, and is exposed to nine different degrees of temperature before it is finally condensed. [*Ib.*

To MELVIL WILSON, *Merchant, for an improved method of Cleaning Paddy, or Rough Rice.* Dated February 6, 1830.

In the drawing attached to the specification of this patent is represented a beam or shaft, to which are attached four cranks, from which proceed an equal number of rods, having at their extremities a cylindrical piece of metal, about two feet in length, and of three inches diameter, the lower surface being made slightly convex. These form pestles, each of which works in a mortar of a peculiar construction, which appears to constitute the principle feature of the patent. A solid piece of metal to resist the action of the pestle forms the lower part of the mortar. A series of curved ribs of the same material are inserted in the solid stand; and around this framing, woven wire or perforated metal is affixed, thus combining a sieve with a mortar, the effect of which will be, that from the flour of the rice being expelled, the liability to clog the pestle and to heat the rice, is prevented; and as the great pestle and shaft, usually employed in machines of this nature, are dispensed with, the smaller pestles can, without any addition of power, be propelled with much greater velocity, without the danger of heating the grain. The perforations of the "sieve mortar" are directed to be made large enough for the passage of the flour, but at the same time too small for the rice.* [*Ib.*

FRANKLIN INSTITUTE.

Quarterly Meeting.

The Twenty-seventh quarterly meeting of the Institute, was held at their Hall, October 21, 1830.

Mr. S. V. MERRICK, was appointed chairman, and

WILLIAM HAMILTON, recording secretary, pro tem.

The minutes of the last quarterly meeting were read and approved.

The quarterly report of the Board of Managers, and also that of the Treasurer, were read and accepted.

On motion, the report of the Board of Managers was referred to the committee on publications, with instructions to publish such parts as they may deem expedient.

S. V. MERRICK, *Chairman.*

WILLIAM HAMILTON, *Recording Secretary, pro tem.*

* This patent is manifestly taken for an American invention. By turning to vol. iv. page 49, it will be seen that "on the 17th of May, 1828, Mr. Ravenel (of Charleston, South Carolina,) obtained a patent for a mortar for cleaning rice. The bottom of this mortar was solid, but the sides were composed of wove wire, supported by ribs; this formed a sieve which allowed the flour, or dust which is formed in the pounding, to escape; which dust, in the ordinary mortar, causes the materials to heat, and greatly retards the operation."—EDITOR.

Twenty-seventh Quarterly Report of the Board of Managers of the Franklin Institute.

The Board of Managers of the Franklin Institute, in compliance with the requisitions of the constitution, offer to the society the following report of their proceedings during the third quarter of the present year.

The most conspicuous transaction of the last three months, was the exhibition of domestic manufactures, which was opened on Monday, September 14th, and continued for the five succeeding days. This exhibition, as regards the quality of the articles, in reference to their prices, the novelty of some of the products, and the evidences afforded of improvement in many branches of manufactures, has been highly creditable to American industry.

The greatest interest has always been displayed by the public in these exhibitions, and it is estimated that the last was visited by not less than 20,000 persons, all of whom appeared gratified by the beauty and variety of the articles, and the judicious arrangements under which they were exhibited. The benefit to the manufacturer from the opportunity thus afforded of making his productions extensively known, is too generally felt and acknowledged to render it necessary that it should be dwelt on, and yields every encouragement for the Institute to continue their exhibitions.

In the report of the committee on premiums and exhibitions, which the Board will lay before the society, will be found all the interesting details connected with the last exhibition.

The investigations relative to the value of water as a moving power have been prosecuted with unabated zeal and industry by the committee entrusted with the subject. The experiments on wheels of 15 and 10 feet diameter are completed, and a wheel of 6 feet diameter is now constructing. The committee will close their investigations on the completion of the experiments with this wheel, and the reaction wheel now making by Mr. Wing, of Gardiner. A report of their investigations is preparing, and the Board hope soon to present it to the society.

The inquiry respecting the causes of explosion of steam boilers has been industriously pursued by the committee appointed for the purpose, and the Board expected by this time to have laid the result of their labours before the society. But a communication has been had with the Secretary of the Treasury, which will probably lead to a fuller and more extensive and useful investigation than was originally contemplated, and which will postpone the period at which a report may be expected.

The regular winter courses of instruction have just commenced, and it is believed under very favourable arrangements. Instruction will be given in mechanics and natural philosophy, chemistry, mathematics, and architectural and miscellaneous drawing, by competent teachers, and at an expense to the students so moderate as to place it within the reach of every mechanic. The Board cannot urge too strongly on the society the importance of these schools, and refer to the published address and advertisement of the committee on instruction for further details.

The apartments in the Hall appropriated for reading rooms have been opened since the beginning of last month, and furnish to the members a useful and instructive place of resort.

The arrangements of the library are nearly completed, and in a few days the class of the library intended for circulation, will be opened to the members.

In concluding, the Board cannot but congratulate the society upon the continued prosperity and extended usefulness of the Institute, and urge upon them the importance of zealously pursuing to completion the various plans which constitute the objects of our association.

All which is respectfully submitted.

S. V. Merrick, *Chairman.*

William Hamilton, *Actuary.*

Report of the Committee on Premiums and Exhibitions, on the Sixth Exhibition of the Franklin Institute.

(Concluded from page 279.)

Documents annexed.

Extract from a communication on Silk, and Silk Goods, made to the Committee of Premiums and Exhibitions, by two of the Judges on those articles.

The undersigned have attentively examined the various articles contained in the catalogue submitted to them, and herewith returned, and on the whole they find ample cause to congratulate the country on the great progress which this most important branch of industry has made in the course of the present year.

Hitherto the exhibitions of American Silk have been chiefly confined to the sewing silk and twist, of which a considerable quantity is made in several of the states, but particularly in the state of Connecticut, where this manufacture has existed for the space of seventy years. But for want of the machinery which is used in Europe for doubling and twisting the threads of raw silk of which it is made, it is evident that it can never attain the required degree of perfection until the *throwsting mill* shall be imported and brought into use in this country. It is also to be observed that such silk is made with the best of the cocoons, which in Europe are used only in the preparation of silk for the manufacture of fine stuffs; of those stuffs which we import yearly from France to the amount of from eight to ten millions of dollars.

These facts have been made known to this country through a series of essays, which were published last year in our newspapers, by Mr. D'Homergue, with the aid of Mr. Duponceau, of this city; and being afterwards republished in the form of a pamphlet, have drawn the attention of the national legislature; one branch of which, the house of representatives, have ordered six thousand copies of it to be printed for their use, and have in contemplation measures founded on the suggestions of that book, the object of which is effectually to promote the growth and manufacture of silk in this country.

Mr. Duponceau and Mr. D'Homergue desirous of proving, by undeniable facts, the truth of the assertions they have made in the

essays above mentioned, and particularly the indispensable necessity of perfecting the art of reeling silk from the cocoons, before any thing can be successfully attempted in the way of manufacturing the article, have united their efforts to promote that desirable result. A filature has been established by the former of these gentlemen, under the direction of Mr. D'Homergue, in which ten reels are employed; each of which is worked by two women, whose labour Mr. D'Homergue superintends and directs. We have viewed this establishment, and have the satisfaction to state that it promises to be of great advantage to the country. The women appear pleased with this kind of labour, which is not at all fatiguing, but only requires that attention, and manual dexterity in which females generally excel. It is also not unhealthy, as it cannot be performed in a close building, but requires a place in which the external air is freely admitted. Therefore the filature is not in a room, but under a shed, entirely open on one side, and wherever else it is not necessary to exclude the sun in the hot days of summer. In rainy and damp weather, the reeling is suspended, and the women are employed in cleaning cocoons, or in some other preparatory work.

We have been thus particular in stating these preliminary facts, as we think they will lead to a clearer understanding of the observations we are going to make on the several articles deposited by Mr. D'Homergue at our last exhibition, which have principally attracted our attention; as they show the immense progress which, through his means, has been made in this country, in the short space of a year, in the art of preparing and manufacturing silk. Those articles are the following.

1. A reel for winding off silk from the cocoons made chiefly on the model of the Piedmontese reel, of which there is a silk manual, published in 1828, under the authority of congress, but much simplified, and in our opinion improved, by Mr. D'Homergue. It appears to work very easily; all the reels employed in Mr. Duponceau's filature, are on this model. He also exhibited an ingenious machine for winding and spooling silk, without making use of the spinning wheel.

2. Mr. D'Homergue also deposited 25 pounds of raw silk of the three qualities, singles, organzine, and tram. The material appears of the greatest beauty, and fully justifies the eulogiums that have been passed on American silk. As to the perfection of the reeling, it is sufficiently proved by the beauty of the stuffs made out of it, which will be presently mentioned.

3. Mr. D'Homergue, moreover, deposited by way of specimens, six small skeins of sewing silk, made by him out of imperfect cocoons, and waste and refuse silk, of which the material was at the same time exhibited; these skeins were dyed of various colours, by Messrs. Le Duc and Langueberg, of this city. Mr. D'Homergue not having had sufficient notice of our exhibition, had not time to make more. Although this sewing silk was made without the aid of a throwsting mill, (of which there is none in this city,) we are of opinion that it is equal to any imported. This offers a clear proof of the fact that the practice of making sewing silk out of the best cocoons, and the

best materials of the cocoons, is a ruinous misapplication of the gifts of providence.

4. But what attracted most our attention, as well as that of the visiters of our exhibition, was a splendid flag displaying our national colours, made by Mr. D'Homergue, entirely of American silk, reeled and prepared by himself. This flag is thirteen feet long, and six and a half wide, and such is the fineness of the threads of which it is made, that it weighs only nine ounces and a quarter. The stuff resembles that which is called Florence, of which great quantities are annually imported from France into this country; of the same stuff Mr. D'Homergue made and exhibited three beautiful handkerchiefs, one white, (the natural colour of the silk,) one blue, and the other red. The two last were dyed, and all three printed with elegant flowers round the edges and in the middle, by Messrs. Le Duc and Languebeg, whose colours are as lively and brilliant as any we have seen. It is to be observed that both the flag and the handkerchief were wove without passing through the throwsting mill, which Mr. D'Homergue asserts could not have been done with any other than American silk, and that any other silk would have become fuzzy by undergoing the operations of boiling and dying. We did not observe that this circumstance made any difference in the beauty of the tissue.

The manufacture of silk goods consists of three principal operations; the first is the reeling of the silk from the cocoons, in the form of a raw article for exportation or domestic use; the second is doubling and twisting the raw silk by means of the machine called a throwsting mill, making what is called *thrown silk*, which may be sold abroad or used at home; and the third, and last, is weaving the silk into various kinds of stuffs. We are happy to state that there will be no difficulty in introducing among us these two last branches of the silk manufacture, as well as that of dying in the beautiful colours of Europe. There are in this city, and no doubt in other parts of our union, skilful silk throwsters, silk dyers, and silk manufacturers, but, we understand, they cannot get employment for the want of raw material properly reeled, and we have reason to believe that it is extremely difficult to procure reelers from Europe, therefore we view with pleasure the establishment set on foot by Mr. Duponceau and Mr. D'Homergue, and hope it will be the source of immense benefit to our country.

The articles of silk manufacture deposited by others than Mr. Duponceau and Mr. D'Homergue, are the following.

No. 6. By young ladies in Connecticut, one bundle of sewing silk.

No. 213. By D. Bulkley, one box and one bundle of sewing silk.

No. 302. Five bundles of sewing silk made last year in Philadelphia, by Miss Mary Brash, under the direction of the silk society. The raw material was reeled with the Piedmont reel, the silk was twisted by the common spinning wheel. This silk was very good. The last, No. 302, was made in Connecticut; it is marked on the label, made by machinery; it is presumed to have been thrown or twisted by Mr. Beloe, an English silk throwster, who, it is said, re-

sides in Norwich, and has brought his machinery with him. It was fine silk. We think it proper to observe that all this silk was made out of the best silk of the best cocoons, while the specimens of Mr. D'Homergue were made out of imperfect cocoons and waste and refuse silk, and without machinery.

The silk suspenders, No. 5, by Mr. Joseph Ripka, and No. 182, by Mr. James Davis, are well manufactured, and deserve credit. The silk stockings, Nos. 123 and 125, by Mr. George Tupman, are well made, but of foreign silk, which costs $12 a pound. In Europe, suspenders and silk stockings, except the very finest, are made of floss and refuse silk.

The other articles do not appear to be made of American silk; but it is possible that some of them may be.

On the whole, we are of opinion that the specimens exhibited deserve encouragement.

Extract from the report of the Committee of Judges of the Cotton Goods exhibited at the Masonic Hall, on the 14*th of September,* 1830.

The committee to whom was referred the examination of the cotton goods exhibited at the Masonic Hall, on the 14th instant, under the direction of the Franklin Institute, respectfully report:

That the cultivation of cotton, in the United States, which has for several years been rapidly increasing, has become an object of the first importance, as furnishing the most valuable article of our exports, and as supplying a staple which is now manufactured at home to an immense extent.

The climate and soil of a large portion of the union being well adapted for its growth, the cultivation of it will continue to increase; and as the foreign market will only admit a certain quantum for its supply, it is of great importance that a regular and steady market for the surplus should be found at home. This can only be insured by extending our manufactures of this article in its various branches in our own country, thriving under the protection of government, and advancing by degrees so as to take in the whole range of cotton goods. The committee view with much pleasure the great improvement which has taken place within the last few years in this branch of our manufactures, and in the rapid progress which has been made in the different kinds of finer work. From the coarse brown shirtings, we have already advanced to cambrics of a handsome quality, and the improvement in prints and other varieties of the manufacture, is proceeding with a rapid pace.

To afford this branch of our manufactures an adequate protection, so that it may stand upon a firm and secure basis, and be further increased, is an object worthy the attention of our government, and interesting to every one who takes a pride in beholding our country advancing with a steady step to wealth and independence.

In the exhibition of cotton goods this year, at the Institute, the

committee have viewed the different samples which were submitted to their attention, and proceed now to submit the details of their observations in the order they occurred.

The bleached muslins manufactured by the Scituate Company, were the finest goods exhibited of their kind, and the brown shirtings from the same works, made of yarn No. 40, elicited the approbation of all who examined them.

The Phœnix shirtings were of good width and quality, creditable to the manufacturers, and calculated to maintain their standing in the public estimation.

The committee examined with pleasure some $\frac{9}{8}$ cambric muslins, made at Arkwright mills, and also some manufactured by Philip Allen. The fabrication of this article being as yet in its infancy here, there is of course much room for improvement therein; but the samples exhibited, although too heavy, afford evidence of what may be done in this description of goods, and the committee hope the time is not far distant when a much superior fabric will be produced by the skill and perseverance of our artisans. The demand for cambric muslins is very extensive, but those of $\frac{6}{4}$ width being much more desirable than those of $\frac{9}{8}$, the committee would recommend the manufacturers to turn their attention to the making of the former, not doubting but they will find their interests promoted thereby.

The reel of fine spun cotton, one pound of which, it was said, would extend to a distance of forty miles, manufactured by William Young & Co. being a new article, and intended to be used in the fabrication of what are termed Swiss muslins, which have not been hitherto made in this country, was noticed with much pleasure, and with the best wishes for the manufacturers' success.

Mott's spool and floss cotton, and wire thread, of which various samples were exhibited, afford evidence of attention and skill in this branch of manufacture, and may be safely recommended as very good of their kind.

The damask and plaid table covers, made by Mr. William Perry, are a new article, deserving of encouragement, and affording pleasing specimens of his taste and ingenuity. His $\frac{4}{4}$ ginghams are the first which have been exhibited, and a fair article.

The indigo blue checks, made at the Penitentiary, are a good fabric, but those exhibited by Groves and Fleming the committee consider as much superior to any which have been imported or manufactured here, and as therefore meriting their highest praise.

In the double blue, black and white, and lavender prints, made at the Eagle Print works, a decided improvement as to finish and execution is observed, and in the increased demands for them which will thereby be created, it is hoped the manufacturers will find an ample reward for their skill and enterprise.

The Merrimac five coloured prints, of which the committee regret that but one lot was exhibited, fully maintain the reputation they have acquired for beauty of style and excellence of fabric, while they furnish brilliant examples of the great improvement which, within a few years, has been made in calico printing in the United States.

The committee have noticed with much pleasure a considerable improvement in the manufacture and style of the four and five coloured prints made at Taunton, and they have great satisfaction in being able to pronounce that the single coloured prints made at the same place, (taking the price, which is $11\frac{1}{2}$ cents, into consideration,) are better goods both as to style and fabric than any which they have heretofore seen in the Philadelphia market.

The single coloured prints made at Dover, N. H. by the Cocheco Manufacturing Company, are entitled to very favourable notice, for the cleanliness and neatness with which they are printed, and in point of fabric and execution being equal, if not superior, to any thing of the kind which the committee have seen, have been viewed by them with particular approbation. The coloured cambrics from the same works, are decidedly preferable to any which have been offered in this market, or heretofore exhibited, and are, therefore, recommended to the attention of the trade.

Marshall's $\frac{9}{8}$ prints, of two colours, which were the only samples of this width exhibited, are made of good cloth, and the printing upon them is well executed.

The skill and perseverance of Mr. Joseph Ripka as a manufacturer, in producing so great a variety of cotton fabrics, have excited the best wishes of the committee for his entire success. His checked patent net and bird eye lenos, are beautiful specimens of their kind, and his efforts in fabricating the different species of this description of goods, are deserving of every encouragement.

A piece of Canton flannel, made by Mr. Dennis Kelly, elicited commendation for its beauty and finish.

The cotton quilt made of patchwork, by the children of the Northern Liberties and Kensington School, under six years of age, afforded a pleasing specimen of the advantages arising from the cultivation of early habits of industry, and of the useful manner in which children may be taught, in early years, to employ their time in a manner which yields amusement and profit.

Another quilt of the sunflower pattern, made also of patchwork, and containing, it was said, upwards of ten thousand pieces, afforded the committee ample proof of the patience, industry, and economical taste of the unknown maker.

In concluding their report upon the present occasion, the committee cannot refrain from expressing their high gratification in finding the cotton manufactures of the country in so improving a state, and they look forward with pleasure to the time as not far distant, when by the enterprise and skill of our artisans, this important branch of our national manufacture will vie in quality, variety, and extent, with that of any other similar one upon the face of the globe.

Extract from the Report of the Committee of Judges on Hardware.

Your committee of judges on hardware, beg leave respectfully to report:

As there has not been any regular list of articles exhibited, and the particular articles for which premiums will be awarded not being designated, we have thought proper in this report to notice the articles generally, giving our opinion more as to their being merchantable, than their actual utility.

The first article we shall notice, will be the 4 wrought vices from Pittsburgh; these are certainly worthy the attention of mechanics, being well made and finished in a workmanlike manner. One decided advantage over the ordinary English, or even the best tower vice, is that of the screws of the box being cut, which in the English is but soldered in, thus giving a greater durability to that part in which it is most desirable.

Of the cast vices, but little can be said by this committee; the committee on machinery must act upon this; as it is entirely new it must be proven by actual experiment.

The hollow ware made by Seth Boyden is a light and handsome article, and if its lightness does not add to its tenderness, must supersede the common heavy ware now in use. This maker's sad irons are also a good article, and would compare in quality with the celebrated Colebrook-Dale Company's, (not having the price, we can form no opinion in that particular.) In the article of cutlery, the makers (Moss & Co.) have certainly succeeded in producing an article which we have no doubt is good. This is also the case with L. Goujon's wood screws.

Mr. Fiss has also produced a specimen of his workmanship in an article of drawing knives, which has every appearance of being good.

The pattern card of Hovey's plane irons represents very fair tools, which may probably be very good. The pattern card of Clark and Brown, deposited by Goodyear, such as nippers, plyers, &c. represent goods which some of your committee have found quite merchantable. Linley & Co.'s articles of squares, will vie with the best of the English make.

The screw augers made by G. Shetter, being upon a new plan, are worthy the attention of the committee on machinery, as well as the elegant assortment of planes. The variety of locks, as exhibited by Messrs. Day & Co. M. Kates, and Job Baker, does them much credit. There was a number of other articles which we were pleased to find attracting attention, such as Dunlop, Madeira & Co.'s tools; shovel and tongs, and steel shovel and spades by Gleason; hay and dung forks by Goodyear; gilt buttons by Robinson and Schovill; long saws by Rowland. But as most of these have been particularly reported on at former exhibitions, we have deemed it unnecessary to say more at the present time. The waiters must claim some attention; Nash, Ogle, Mustin, and Blackmore, show fully that if they have not arrived at the perfection of the English, they are approaching them by rapid strides. Your committee find a difficulty in entering into a comparison with the different makers of the same article, on account of their not having given their prices. In future, a better plan would be, for depositers to attach the prices to their various articles. In closing this report, your committee must say that the department

with which they have been honoured to pass judgment, has been very creditable to the Franklin Institute.

Note by the Committee of Premiums and Exhibitions.

The Board of Managers at their meeting held October 14th, adopted the several resolutions proposed in the above report, as well as the recommendations for silver medals, which were awarded to the persons therein designated. The medals will be prepared and delivered as soon as possible; due notice whereof will be given.

The committee were further directed to have their report published, and in complying with this direction, they wish it to be understood that they do not hold themselves answerable for all the opinions contained in the reports of the judges, as they embrace some points on which the committee deem it inexpedient or improper for them to express themselves; but they publish them on the responsibility of the very respectable sources from which they emanate.

Monthly Meeting.

The stated monthly meeting of the Institute was held at their Hall on Thursday evening, September 23, 1830.

Mr. S. J. Robbins, was appointed chairman, and

Mr. F. Fraley, recording secretary pro tem.

The minutes of the last meeting were read and approved.

The following donations were presented to the Institute, viz.

By Mr. P. Barton.

Elements of Botany, or Outlines of the Natural History of Vegetables.

Flora Virginica.

A Discourse on some of the Principle Desiderata in Natural History.

New Views of the Origin of the Tribes and Nations of America.

Observations on some parts of Natural History.

Fragments of the Natural History of Pennsylvania.

A Memoir Concerning the Disease of Goitre as it prevails in different parts of North America.

A Memoir Concerning the Fascinating Faculty which has been ascribed to various species of Serpents.

Written by the late Professor Barton.

By Mr. James Crissey.

Goldsmith's Works.

The corresponding secretary laid on the table the following works, received in exchange for the Journal of the Institute, viz.

The Magazine of Useful and Entertaining Knowledge, for August.

The American Quarterly Review, for September.

The North American Review, for August, 1830.

Southern Agriculturist, for 1828, 1829, and the first 7 Nos. for 1830.

London Journal of Arts and Sciences, for July and August.

The Mechanics' Magazine, for July.

Gill's Scientific, Technological and Microscopic Repository, for July.

The Register of Arts and Journal of Patent Inventions, for July and August.

The Repertory of Patent Inventions, supplement to 9th vol. and No. for August.

Recueil Industriel, for May.

Annales de Chimie et de Physique, for April.

Annales des Mines, Vol. 6, No. 6.

Bulletin de la Société d'Encouragement pour l'Industrie Nationale, for April and May.

The committee to whom was referred the rules for the government of the library and reading room, reported the regulations, which were read, and after some amendments, were adopted.

The committee appointed to report queries for discussion at the meetings of the Institute, presented the following, which were read, and ordered to be recorded for discussion, viz.

What proportions of lime, clay, and oxide of iron, will constitute the most fusible compound?

In what proportion to the metal ought this compound to be, to facilitate to the greatest extent the smelting of iron, and to defend the melted mass?

The subject of the explosion of the boilers of steam engines was taken up, when Mr. Keating addressed the meeting, and gave an account of the explosions on board the steam boat United States, and on Lake Erie. Professor Johnson also addressed the meeting, and read a series of questions and answers on the subject; he also gave an account of Mr. J. J. Rush's plan for preventing accidents in boilers by the collapsing of the flues. Several other gentlemen also spoke on the subject, after which the further discussion was deferred until the next meeting.

S. J. Robbins, *Chairman.*

F. Fraley, *Recording Secretary pro tem.*

TO THE MONTHLY MEETING OF THE FRANKLIN INSTITUTE.

On the Explosion of Steam Boilers.

The inquiry on the subject of steam boiler explosions, now pending before this Institute, and which is understood to be the topic for discussion this evening, is unquestionably of more importance, particularly as it regards the community, than any question that has hitherto engrossed its attention. The primary object of attainment, is the preservation of human life.

The explosions that have so recently and repeatedly shocked the ears of the public, have also had their effect to create and foster a popular feeling of prejudice against the employment of steam engines, especially for purposes of locomotion. To allay this excitement, therefore, and to render the engine as harmless as it is powerful, is

an endeavour peculiarly worthy of this Institute, as its accomplishment must tend in an eminent degree to place this most important auxiliary, the *primum mobile* in the mechanic arts, upon that footing which its utility so justly demands.

The information that has already been afforded at several of the past meetings, by the members who have taken part in the discussion of this subject, must have fully shown that ample room exists for improvement. That some of this improvement may readily be effected by legislative enactments is reasonably admitted; it would, however, be regretted, should undue fears and prejudices subject this invaluable machine with an encumbering load of legal friction.

That a boiler well made and of suitable materials, kept constantly clean and free from sediment, with a safety valve of proper proportions and prudently loaded, and having always a sufficiency of water above the fire surface, should ever explode or burst, is indeed a paradox.

A communication in relation to the materials for boilers has recently been made to this meeting. Ocular demonstration has also been shown of the effects to be apprehended from the accumulation of sediment; and some pertinent remarks made in reference to the use and application of halliards to the safety valve. In this communication, therefore, I shall merely advert to one or two particulars which appear to have a connexion with these subjects, and then pass to the consideration of the quantity of water in a boiler, and the several means for its determination.

What method is best adapted to prove, occasionally, the requisite strength of boilers, is believed to be a query worthy of particular notice. The expensiveness of these articles is no inconsiderable drawback to their renewal. Few individuals can be disposed cheerfully to incur this, so long as there remains a ray of hope to defer it, hence it is not uncommon to find boilers used until they have become reduced to a mere shell.

Now as every steam engine is furnished with a forcing pump in connexion with its boilers, a very simple and effectual test is suggested, which may be resorted to with much facility. With boilers that have been long in use, something of this kind seems particularly called for. That this mode of proving might be carried to excess, and the boilers strained, cannot be denied. But that if it be reasonably made, it would be safer, surer, and less injurious to the boilers than by the ordinary mode of proving with a hammer, is on the other hand equally clear and certain. On this account it might be urged, whether the interest of the proprietors would not be promoted by the adoption of the hydrostatic proof.

The safety valve being the only vent to the boiler when the throttle valve is closed, it is all important, therefore, that its construction be such as not to engender the least derangement in its operations. Instances are recorded of these valves sticking, some in an extraordinary manner. This has been accounted for on the supposition of a glutinous matter being formed on the seat of the valve, arising from the use of meal, &c. in the practice of stopping leaks in the boiler.

It is rather unfortunate that the accounts given of these events have seldom been accompanied with such data as might enable others to prevent a similar occurrence. We have instances of the safety valve sticking, when thrown, by the effort of the steam, considerably above its seat. Effects of this kind may be accounted for, by the position which the link that connects the spindle of the valve, with the lever or spanner, might assume, nearly horizontal, or such that the weight on the lever would tend only to bind the spindle between the bridges. It is not improbable that something of this sort may take place when the valve is in its seat; for the link being short, but little wear, or looseness, on the pins, will cause the weight on the lever to press obliquely against the spindle of the valve, and thus produce the effect.

It is believed to be a current opinion, that what is properly termed an explosion, universally originates from an insufficiency of water in the boiler. That the upper part of a boiler charged with steam may become red hot when immediately acted upon by the fire, may be satisfactorily shown by a simple experiment with a small vessel in which steam may be formed, by a lamp, and a blowpipe. We have, however, ample testimony that this effect may be produced on a larger scale. Instances are mentioned in the paper of M. Arago, published in the last July number of this Journal. To this paper I may also refer for the experiments of Perkins in support of the instantaneous formation of steam, a matter of the greatest moment in the exposition of steam boiler explosions.

The fact of the *foaming* of certain liquids, hinted at in the above mentioned essay, experiments with a glass boiler will prove substantially correct. In addition to the liquids therein named as producing a commotion more violent than pure water, viz. sulphuric acid and milk, we may mention those of salt and muddy water, which will operate thus, in proportion to its specific gravity.

With a transparent boiler it may be seen, that when the water is made to boil under a certain pressure, the bubbles of steam which are continually ascending, produce a current from the sides of the boiler, towards that end where the fire acts with the least intensity. If the pressure be increased, this effect for a short time ceases, the water becoming completely dormant. On the contrary, when the pressure is suddenly removed, the bubbles ascend with great violence, changing the body of water into *a froth, and raising it considerably above its former height.*

This effect will be produced whether the safety valve, throttle valve, or gauge cocks be opened, and it deserves particular notice, as it must show how precarious and uncertain the latter instruments may be to indicate the real height of the water in boilers.

Various contrivances have been proposed, with a view to obviate this difficulty with the gauge cocks; few, however, have as yet been brought into general use. The best, (in theory,) of these substitutes, is perhaps that of placing a glass tube in front of the boiler, with one end of the tube communicating with the water, the other with the steam. Whether so fragile a material as this can be employed with

safety for the above purpose is left for experiment to decide. With the small glass boiler already referred to, thirty pounds to the square inch has been borne without fracture.

Among the numerous improvements in the steam engine, by Mr. Watt, we find that of a contrivance very simple in its construction, by which the engine is enabled to feed the boiler with the necessary quantity of water. This contrivance is doubtless familiar to every one. It is applicable to low pressure engines only, and for a reason sufficiently obvious, has seldom, if ever, been used, but with such engines as are of the stationary kind. A feeder on Mr. Watt's principle, with the original pumice stone float, is at present in use at the Globe Mill, in the vicinity of this city. In vol. iv. page 347, of the Journal of the Franklin Institute, a brief description is given of a feeder, invented by Mr. Doolittle, of Bennington, Vermont. As this contrivance appears to have been before the committee of inventions of this Institute, it will be unnecessary here to give it in detail. It will suffice, therefore, to observe, that this feeder, like that of Mr. Watt, has its regulating cock (or valve) between the forcing pump and the boiler, and that the pump must be continually urging towards the boiler its maximum quantity of water, whether the boiler is in a state to receive it or not.

The following drawing exhibits a small experimental steam engine, with a feeder connected with it, which acts in a manner entirely different from either of the preceding. This feeder has been found to answer its purpose in the most satisfactory manner, without any peculiar nicety of workmanship in its construction.

References to the Figure.

A, B, the furnace.

C, D, boiler; this consists of a large three necked glass bottle, commonly known by the name of Woolfe's bottle.

E, F, a box or cistern to contain water for the supply of the boiler. The waste steam of the engine is also thrown into this box.

P, the forcing pump, *f*, *f*, the feed pipe leading into the lower neck of the boiler.

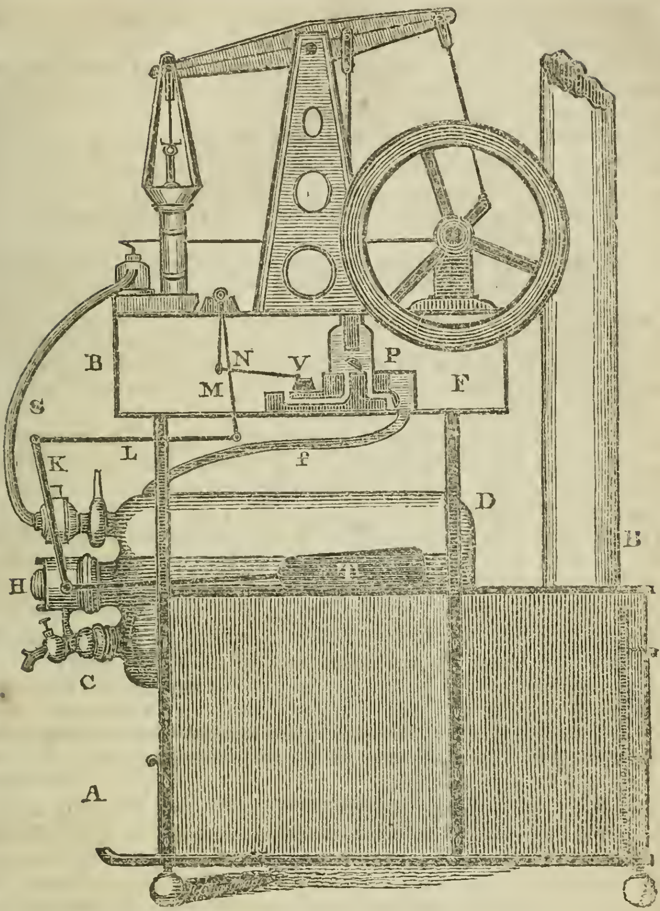
S, steam pipe.

H, a cap fitted on the middle neck of the boiler, in which the spindle of the float works.

T, the float.

V, a slide valve. This valve is made of a flat piece of brass ground true to its seat, and is intended to open or shut the communication between the pump and cistern.

K, L, M, N, the connexion between the float and valve.



For a more detailed description of this feeder, I beg leave to refer to the communication published in the last July number of the Journal of this Institute.

It will be perceived that the above feeder depends for its action upon the buoyancy as well as the gravity of the float; it is therefore believed that a wooden body bound or sheathed with metal, will be as suitable for the float as any that may be devised. Should the float become heavier by absorbing the fluid on which it rests, the effect would be to keep the water in the boiler, at a greater height above the fire.

That the float may have sufficient play in boilers having flues passing through them, the rod upon which it acts may be forked, with a small float on each prong, so as to straddle the flue. For a vertical cylindrical boiler, a float of an annular form is suggested.

Now that we are on the subject of floats, it may be observed that hollow copper vessels have been tried with Mr. Watt's feeder, but the difficulty with these has been, that by frequent expansion and contraction, the parts soldered together have opened so as to cause the vessel to fill with water and sink.

The pumice stone is sometimes objected to, as its gravity is susceptible of variation, by the accumulation of sediment in its pores. As this float, however, is at present used for Watt's feeder, we apprehend that there is not much difficulty in keeping the float clean and well counterpoised.

It is needless to insist upon the importance of a good forcing pump for an engine, with or without a feeder. The manner in which it is proposed to construct the working parts of the feeder exhibited by the drawing, it is believed is such as to create the least possible friction or hinderance to its operations; the amount of friction to be overcome at the spindle on which the float acts, may be readily inferred by a reference to the common throttle and governor valves, the spindles of which are fitted in the same way. Another advantage attending this arrangement, it is presumed, will be, that as the rubbing part of the spindle is constantly covered with packing, no impediment will be so likely to occur from rust.

In the usual construction of Mr. Watt's feeder, the wire that connects the float with the valve, slides up and down through a stuffing box; here, in addition to the pressure of steam that must be contended with, the wire is continually passing from the atmosphere of steam within the boiler, to the common atmosphere without, and liable, therefore, unless properly attended to, to become rusty.

The other parts of the feeder need no further explanation than what has already been given in the communication above referred to, we wish only to repeat, that this contrivance can only feed so long as the pump or engine is in operation; it will, however, be a *tell-tale to the boiler under all circumstances.*

An objection is not unfrequently made to improvements of this kind, on the supposition of their having a tendency to make the engine men careless and inattentive; to this objection it has already been answered, "it is a very mistaken idea, that because steam engines usually move without attention to them, such attention is not required."

All of which is respectfully submitted.

Charles Potts.

Philadelphia, October 27, 1830.

Remarks on the frequent Explosions of Steam Engine Boilers in the United States, and on the construction and operation of two boilers now in use. By D. J. Burr.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—With much pleasure I see announced the determination of the managers of the Institute, to investigate the causes of explosion of

steam boilers, and, if possible, to devise some adequate remedy or preventative for an evil so alarming. The occasion is the more urgent, as it seems not improbable that competition induces the owners of "low pressure" boats to encroach somewhat on the prerogative of their *more pressing* compeers; and there is so much temptation to progressive improvement in that particular, that we may expect to hear of, if not to experience, the consequences, in more frequent and horrid detail, from year to year.

It cannot but have occurred to every one conversant with this subject, that while in our country, explosions are frequent and dreadful, we hear of no similar catastrophes in Great Britain; and we are led to inquire, what regulations have been adopted and legalized there? and how far may those rules have contributed to this exemption? If on this point it be said that British steamers are universally of low pressure, it should be recollected that our "low pressures" are not exempted from casualty, and that *theirs* are employed almost exclusively in sea water; and a great proportion of them having iron boilers, it might be apprehended that corrosion would be rapid, and the materials would eventually become deficient, and give way.

The same observation, however, applies with equal truth to high pressure steam in Great Britain; and if the inquiry be made why they are exempt from such terrible disasters as occur in this country, not seldom even on land, the answer may probably be, that *their* high pressure is limited to 50 lbs. to the inch, while ours is very commonly three times as great; and as it can hardly be expected that accidents will not sometimes occur, so it must be supposed that as more powerful steam is used, explosions will be more than proportionably frequent and dreadful in their effects.

Provision by law for a strict original survey, and for subsequent frequent proofs, is, perhaps, necessary, and would be most effectual in connexion with such other guards as are obvious, and have often been proposed.

I am aware that what is said above would appear trite if offered to the committee, or to any person well informed on the subject: but this is a matter of public concern, and the public need information. No danger is so alarming as that of which we know not the nature and extent; and it is only by a fair exposition of facts that the general excitement and apprehension can be restrained within rational limits.

But the committee want facts, and on a matter of such great importance, it is hoped that no one will withhold any thing calculated to bear on the questions at issue. In giving my small stock of information, I premise that, although familiar with steam for some years past, I *know* nothing of it as used at 150 lbs., or, indeed, any thing over 50 lbs. to the inch. That it will continue to be used at the highest practicable extreme on our western waters, and wherever freight is a prime object, we need not doubt; but that it will be so employed without ultimate dire disasters from the gradual corrosion and weakening of the boilers, we have no reason to expect. With this impression, however, I cannot but consider the use of such high

steam on land, as of very doubtful expediency, involving a risk but poorly compensated by the economical advantage.

I shall now state some facts to prove that the tremendous explosions now of so frequent occurrence, do result chiefly, if not entirely, from the use of steam of excessive power.

The boiler of a high pressure engine, (not new,) working at a coal mine in this vicinity, is of wrought iron, $\frac{5}{16}$ thick, and supplied with "copperas" water so slightly impregnated, that it is commonly drank by the workmen. After a few weeks from the commencement, it was discovered that the boiler plate immediately over the fire place was cracked and leaking. The steam was limited by the safety valve to 50 lb. the inch, and the engine at full work: the leak continued for several days without material increase, and the boiler was then repaired with a large and good plate, and it was then ascertained that the front end of the boiler being rather lowest, a considerable deposit similar to iron rust was made at the place where the old plate was burned.

In the course of four or five weeks more, it was perceived that a blister was raised on the new plate, and as the engine could not be dispensed with, and the means for repair were not at hand, the protuberance daily increased until it became, as the fireman expressed it, as large and deep as a hat crown. In about ten days it burst, while at full work, and the iron was found to be attenuated to less than $\frac{1}{8}$ of an inch at the thinnest part. The explosion, if such it can be called, was entirely harmless, no one happening to be at the front end, and neither the boiler nor the bricks of the furnace were disturbed.

The boiler was then taken up, repaired, and improved by adding several transverse pipes of cast iron, on a plan similar to the boilers of Woolfe's engines, in Wales. The engine has been running since, about 6 months, and doing well; the pipes being regularly and conveniently cleaned, and there is no appearance of injury, or apprehension of failure.

What remains of my experience as applicable to the inquiry before us, will be best given by a short description of the peculiarities of a small engine attached to the Richmond foundry, which has been used for 12 months past.

The boiler is a cylinder, to which transverse pipes are attached below by short necks, on the plan mentioned above, but on the whole length; these pipes are covered with fire bricks, and the spaces between the necks are closed. The fire acting first below the pipes, returns above them on one side of their necks, and passes off by the other side. This boiler appears to be in some respects peculiarly safe, viz. the cylinder is not likely to be heated dangerously hot, although it should be quite emptied of water. The pipes which are exposed to the most intense heat, are least likely to be empty, and being weakest, would yield first, probably without injury, except immediately in front of the furnace, and experience has indicated a safeguard against this possible danger. On one occasion, by the negligence of the fireman, the water was suffered to exhaust, until

the pipes became empty, and this fact was announced by steam issuing from one end of a pipe where it was found that the pasteboard with which the joint of the cap or cover was made, had become charred or burned by the heat of the pipe, thus giving vent to the steam, and alarm to the fireman. The furnace was cleared, the defected joint repaired, water supplied, and the engine in operation again in ten minutes.

In addition to the usual gauge cocks, and for greater safety, there is attached to this boiler a float with a lever, intended to operate in the mode described in your Journal for July, of an improvement by Mr. Potts, with this difference, that it was arranged to regulate a *waste* cock, by which surplus water should be returned to the hot cistern. This has not been completed, because it is found that the float is so much agitated, probably by the ebullition from the pipes; that it is considered rather unsafe to rely upon it. For economy of fuel, I consider this boiler equal to any I have known in use; it occupies less ground, and the reports of the performance of Woolfe's engines, at the Cornwall mines, and the long time they have been used, seem good proof of their safety, utility and economy.

Respectfully yours,

D. J. Burr.

Richmond, Va. October 9, 1830.

Reply to the remarks of "A Manufacturer," on an improvement in Piano Fortes, patented by C. P. Sakmeister. *By the* Patentee.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—In the September number of your Journal, I noticed some remarks on C. P. Sakmeister's improved piano forte, said to have been made not insidiously, and charging the said Sakmeister directly with having revived modern antiques. I trust you will be so kind and impartial as to admit this communication in refutation of an anonymous article, assailing my reputation as a mechanic, under the signature of "A Manufacturer," thereby insinuating that as such, he ought to be a judge of what he writes about; but if his pianos, or whatever he may manufacture, are not better than his reasoning, or cannot stand the test of time better than his assertions can of truth and veracity, it will not be impertinent to predict that they will soon be deservedly condemned and forgotten. I should not have condescended to vindicate my reputation against an anonymous, and, I think I may say, a malicious writer, had not the article appeared in your widely circulated Journal.

How far there is even a shadow of truth in *A Manufacturer's* statements, I shall leave the public to judge, after having made a few remarks. It evidently appears *A Manufacturer* is not acquainted with the different piano forte actions, where he says that "the simple catch attached to the key is certainly preferable," and again, "by taking off the top of the action, each key may be taken out." Now, sir, permit me to say, it never has been before successfully attempted

to introduce the catch (or check) in the English action. In the action now made by Stewart, Clementi and Broadwood, and now made from them in the United States, although the catch is introduced in that action, yet it is of an entirely different mechanical construction. In the action to which I affix my catch, each key can be taken out without deranging any part of the same, and I cannot possibly conceive how "perplexity" can exist; moreover, the patented improvement of my catch consists only in adding a thin wire to each key, which pressing the lever catch against the hammer, prevents the same from rebounding even in the quickest movements.

A Manufacturer wishes to have it believed that the Messrs. Loud have made this invention long since, but I can prove by many persons, that only after much time and many trials, could I attain that perfection for which I took out my patent, and shall not abandon the same until I see more proofs than the assertions of a nameless Manufacturer, who, I shall show in the sequel, hesitates not to misrepresent what he is well aware to be matter of fact. From what has been said, I presume no person will doubt that a great improvement has been made, first, and only by me; and if, as *A Manufacturer* acknowledges, the improvements of Messrs. Loud have been laid aside by them, I can assure *A Manufacturer* that I have no thought of laying mine aside, no derangements as yet having taken place, and it is probable never will. I would, however, advise *A Manufacturer* to arrange this point with the Messrs. Loud, and not with me, till he can convince any one that their improvement and mine are alike.

A Manufacturer's remarks on the English action are obviously to mislead the public; he stops not there, but asserts what he must know to be a falsehood, if he (as he says) has seen my specification. I never therein laid claim to the invention of a hammer, as he remarks, "such hammer as I claim (the hammer of the inverted action) had been made before me by Mr. Albrecht," thereby clearly saying I claimed the invention of the hammer, when I never in my patent even alluded to it. I claimed as my invention the construction of the hammer shank, and through its form making the jack of my action produce an immediate effect on the hammer; and also applying to this action the lever catch of my invention, as used by me in the English Action piano fortes, producing by the combination (though certainly not a "perplexed" one,) of the jack, hammer, and front catch, a powerful and quick action; how far I have succeeded, those who have seen my piano fortes are the best judges, and here I shall leave *A Manufacturer* with remarking, first, that I shall not reply to any remarks of his, excepting he appears under his own signature, having neither time nor inclination to enter into discussions with nameless writers; and, secondly, being convinced that I have substantial and just claims to my patent, I shall prosecute all infringements on the same, by law.*

Yours respectfully,

CHARLES P. SAKMEISTER.

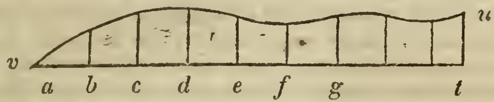
New York, *November* 1, 1830.

* For remarks by the Editor, see page 359.

On finding the Area of an Irregular Curved Figure.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Sir,—I believe the following method of approximating to the area of an irregular curved figure is not generally known. If you think it worthy of a place in the Journal, you will oblige me by inserting it.



Let v, u, be the boundary curve, to any figure v, u, t; a, (in this case $= 0$) b, c, d, e, f, g, &c. be given perpendiculars from the base line v, t, at any given equal distances, to meet the curve. Put n for the equal distances, and the area required $= s$. Then by the property of the trapezoid, $\frac{na + nb}{2} + \frac{nb + nc}{2} + \frac{nc + nd}{2} + \frac{nd + ne}{2} + \frac{ne + nf}{2} + \frac{nf + ng}{2} = s$—reduced gives $s =$

$$\frac{na + 2\,nb + 2\,nc + 2\,nd + 2\,ne + 2\,nf + ng}{2} = \overline{a + 2\,b + 2\,c + 2\,d + 2\,e + 2\,f + g} \times \frac{n}{2}.$$

Rule.—Add all the perpendiculars twice over, except the first and last, which must be taken but once; this sum multiplied by half the equal distances between the perpendiculars, gives the area.

The writer of the above has often made use of this rule with much satisfaction, particularly in land surveying, where the boundary lines fell upon water courses or curve fences. It may likewise be applied to find the contents of all irregular solids, the superficial contents of their surfaces, and in finding the contents of irregular excavation where the bottom is curved, which is often the case in mill races, canals, &c. In surveying, it is obvious that there is no occasion to note down in the field book the bases of the trapezoids, as is necessary in the old and tedious method of taking offsetts, nor yet to make separate calculations for each trapezoid; all a surveyor has particularly to attend to, is to notice whether the curve is very concave, or convex, from, or towards, the base line, and to place the perpendiculars nearer, or further apart, so as to approximate to the area more accurately.

W. B.

Note from Professor Hare, *to* Mr. J. P. Morris, *relative to an explosion which occurred in the Pipe and Drum of a Stove.*

September 28th, 1830.

Sir,—During the last winter, when I was too much engaged in the preparation of the experimental illustrations required by my lectures

to withdraw my attention; you requested that I would explain the cause of an explosion which occurred in the pipe and drum of an anthracite stove. I believe the circumstances were as follows. The fire having nearly burned down, but not being quite extinct, a considerable quantity of old paper was thrown into the stove. An explosion soon after ensued, by which the drum was ruptured, and other derangement produced.

The rationale I conceive to be as follows. By the heat of the fire which remained in the stove, carburetted hydrogen was evolved from the paper, but happened not to be inflamed until sufficient quantity had been generated to form with the atmospheric air in the drum and stove pipe, an explosive mixture. An analogous result upon a more limited scale may be frequently observed when paper or shavings are thrown upon a fire where there is no flame so situated as immediately to ignite the gas evolved. If a piece of paper had been lighted beforehand, and thrown in on the top of the mass, the explosion had been prevented

Sir, your obedient servant,

ROBERT HARE.

On the manufacture of Red, Green, Yellow, White, and other Enamel Colours, and the manner of employing them.

[Translated from the *Dictionnaire Technologique*, for the Technological Repository.]

[Concluded from page 262.]

On White Enamel.—Although white is not a colour, properly speaking, yet it is made great use of in painting upon glass, in enamelling and porcelain painting, and is the natural foundation of those bodies which are white; and we often use this colour under those circumstances in which white is to be figured; it is also employed to represent certain draperies, and generally appears a little raised, in all the pictures upon enamel or porcelain, and we are always obliged to have recourse to it in the management of the tints; in this case, the white is exceedingly useful.

The white enamels are those bodies which are most proper to produce clearness; but as they are, as we may say, composed with silex, so they present great difficulties in their employment with the pencil; and, therefore, those who are occupied in the preparation of colours, have turned their thoughts to other substances, which might replace the white enamel. On this occasion, M. de Montancy, who I have the pleasure to cite as one of the chemists who have rendered the greatest services to this art, having perceived the great importance which would result from our possessing a white not vitrified, for the use of enamel painters, has lately, by many experiments, and great labour, created that which we so ardently desired. I have repeated his processes, and also executed them in different manners, by which I think I have simplified them, or, at least, rendered them much more certain.

We must procure the finest tin, that from Banca or Malacca, and reduce it into very thin sheets, either by the hammer, or the laminating mill; these sheets are then to be cut into small bits, and introduced into a matrass, containing a certain quantity of nitric acid diluted with water. As the tin falls down in the matrass, we see a great effervescence produced, with the disengagement of caloric; in proportion as the solution is effected, there is deposited upon the bottom of the matrass a deutoxide of tin, of great whiteness. We continue the operation until we see that enough of the oxide is procured; we then pour water upon the precipitate, shake the matrass strongly, and pour out its contents into a glass or porcelain vessel; we then repeatedly wash the deposit with fresh portions of boiling water, and then leave it to drain upon a white paper.

When the precipitate is quite dry, we mix it with a little less than its weight of the hydrochlorate of soda (common salt,) very white and crystallized; we then reduce the whole into an exceedingly fine powder, which we pass through a silken sieve, in order to mix it intimately; we then put it into a new Hessian crucible, and expose it to the fire in a furnace for three hours, of which the first two are gentle, in order to permit the perfect calcination of the materials; we then withdraw the crucible, and leave it to cool. We must observe in breaking it, in order to detach its contents more completely, to take every possible precaution that not the smallest particle of the earth of the crucible be found amongst the mass.

We then pulverize this mass anew, which will be of a shining white, if the operation has been well conducted. We then place the powder upon a glass slab, and grind it with a mullar of the same material, with water, until it appears like cream; we then put it into a large porcelain vessel, wash it many times with hot water, and throw it upon a filtre; the white, which remains upon the filtering paper, must then be dried in a gentle heat. It often happens that the great whiteness of this substance does not develop itself before these last manipulations.

We see of what importance it is to possess a colour like this in vitrifiable painting, both in enamel and on porcelain. In fact, there are but few colours used in these arts, which do not frequently require to be modified in their intensity. The pure tints have, without doubt, the greatest splendour; but the half tints often require raising. I know, indeed, that in this respect, a colour applied thinly, and greatly extended, becomes paler, and possesses a demi tint; but it also loses its brilliancy considerably, owing to the little flux which it contains; instead of which, we unite it with another colour, which reduces the too great liveliness of the tint, although it still possesses that brilliant character which we so highly prize, and is constant in this case, which is a marked advantage. I know that these ideas are contrary to those generally entertained, as they pretend that red becomes a flesh colour, by the means employed to lighten its tint; but experience has proved, that the thing is possible, and can certainly be executed. But we have seen in practice, and as we have before said, that to imitate flesh colours, we must employ a

colour which is nothing else than the red from iron, in which there is always a notable quantity of alumine, which, by its whiteness, lowers the intensity of the red, a property which the white oxide of tin, which we have been describing, possesses in the highest possible degree, not only when opposed to red, but also to all the colours which compose the palette of the painter by vitrifaction.

Of Black Enamels.—Black, in the opinion of philosophers, is no colour; but, on the contrary, is the absence of all that exist, or is the deprivation of light. It seems, on a first glance, that such a colour might be easily composed; nevertheless, we experience many difficulties in attempting to succeed therein; as we have two evils to overcome, which are, its dryness under the pencil, and the little intensity of the tint. In fact, if the flux predominate too much, we fall into both inconveniences at once; if we would remedy it by diminishing the quantity of flux, or, still better, by augmenting the quantity of the oxides, we fail alike, and obtained a dead colour, which has no splendour, and which, of course, is unfit for our purpose. If indeed we could pursue a middle course, we might attain our end; but this middle course is difficult to find.

Three metallic oxides concur to form black enamel; these are, the oxide of manganese, that of copper, and that of cobalt. These three oxides likewise contain the elements of the three primitive colours, as we shall see below; so that it would seem easy, by mixing blue, red, and yellow, to form a fine black. Nevertheless, it is not exactly so, as the black produced by the mixture does not take the tint which we desire to find in this colour; thus we see that it is not easy to ascertain their respective quantities; and still more, as the greater or less degrees of oxidation also change them; it necessarily happens that this circumstance has, therefore, a great influence on the results. That the three primitive colours are found in the three oxides above mentioned, the following is a proof:

The blue from cobalt is essentially a primitive colour, that is to say, that it does not owe its origin to any other colour, and, by consequence, is indecomposable; but it is capable, when mixed with another primitive colour, of forming an infinity of tints, of which all other colours are composed. Thus, for example, the oxide of manganese, whose colour, when well developed, is a violet, more or less intense, as is seen in those vitrifications of which this oxide forms a constituent part, is composed of blue and red, two primitive colours. The oxide of copper, which always affords a green colour when it is used in vitrifications, and the fire has not been too violent, may be considered as formed of blue and yellow. We have thus shown that it is the primitive colours united which form black; yet, nevertheless, when we would mix these three colours directly, we do not always obtain the expected result. What is the cause of this particularity? This question has never been answered, and we shall abstain from entering into any explanation thereof.

Having already given the methods of procuring the oxides of iron, copper, chrome, &c., we shall also show the mode of extracting that of manganese.

We take the mineral known in commerce by the name of manganese stone, and which is composed of kidney shaped black and dull masses. Sometimes, also, the black colour varies to a violet; but we give the preference to that manganese stone which is the blackest, and especially as it is always the purest, and heaviest, which shows that it contains the largest quantity of the oxide of manganese. We pulverize this stone, and calcine the powder until it has acquired the property of strongly tinging the fingers, when it is rubbed between them; which shows that the molecules of oxide are sufficiently disintegrated to produce their intended effects; in consequence, we remove the calcined powder from the fire.

We may remark in passing, that this powder will be considerably diminished in weight, owing to the volatile parts which it contained being dissipated during the calcination. As it sometimes happens that the powdered manganese becomes agglutinated by the action of the fire upon it, it must then be powdered anew, passed through a silken sieve, and enclosed in a box.

The black is composed of one part of each of the oxides of manganese, cobalt, and copper, mixed together.

If the black be a little greenish, the quantity of oxide of copper must be diminished; if too blue, then we must act in the same manner with regard to the oxide of cobalt.

Of the chatiron.—The *chatiron* is simply a colour, composed like the black enamels; the difference consisting in the flux being used in a smaller proportion, as it is destined to represent the knots, the sides, and all those parts which appear a little notched or cut, in the leaves of trees and flowers; so that if the flux predominate too much, those traits would become confounded in the fusion of the enamel, and would not produce their proper effect. This colour is generally employed above or underneath green. It may be composed as follows: oxide of manganese, one part; oxide of cobalt, half a part; and oxide of copper, one part.

M. Brongniart has inserted a memoir on the art of enamelling, in *t. IX. des Annales de Chimie;* in which, after defining the nature of the art of the enameller, he adds as follows. "Notwithstanding all the researches of chemists, on the coloration of enamel, yet this part of the art still remains the most difficult, on account of the inability to find new, brilliant, and agreeable colours. But when the enameller begins to discover some new colours by the mixture of different oxides, and knows the manner of rendering his enamel sufficiently hard, and of giving it a fusibility suitable to melt upon the metal, which is to form the basis of the enamelling; and when he can give to his enamel the finest transparency, and the most perfect homogeneousness, he will have nearly become master of the secrets of his manipulations, and likewise of the theories which conduce to these several ends."

"There are two classes of enamel colours, namely, the opaque and the transparent ones.

"The material common to all species of enamels, is a glass, perfectly transparent, and possessed of a sufficient degree of fusibility.

This is the material which the enamellers term *couverte;* and they introduce into it different metallic oxides, as the glass is to be variously coloured, and thus form the following enamel colours.

"The oxide of tin, used in sufficient quantity, will entirely destroy the transparency, and give the enamel a very fine white colour; and especially if we take care, according to the advice of Kunckel, to add a small quantity of the oxide of manganese to it, which, by parting with some of its oxygen during the fusion, burns those inflammable matters which might alter the whiteness of the enamel.

"If, however, we add but a little oxide of tin to a transparent glass, although its transparency is lost in part, yet we shall obtain an enamel which imitates the reflexion of the opal.

"The yellow enamel is formed with the oxides of lead and antimony. Silver, however, also affords a fine yellow, according to Kunckel.

"The red enamel is produced by the oxide of gold, as well as by that of iron; but that produced from gold is the finest; it is also fixed in the fire, whereas that produced from iron is liable to change.

"The oxide of manganese affords a violet enamel.

"The oxide of copper produces a green enamel; and so also does the oxide of chrome, and the colour is more fixed.

"The blue enamel is coloured by cobalt.

"And, lastly, the oxide of iron affords a fine black.

"The mixture of these different enamels in various proportions, produces an enormous quantity of intermediate colours.

"And thus, in making these colours, by mixing one enamel with another, we also mingle the oxides which were previously united with the glass."

After this preliminary information, M. Brongniart proceeds to describe the application of enamel upon those metals which the enameller is commonly in the habit of employing. These are, gold, silver, and copper.

In respect to gold, he says, "that which is twenty-four carats fine, produces an enamel of any required tint, and of a most agreeable appearance; an effect much finer than can be produced upon gold less fine; firstly, because, as it contains no other metal, so it preserves its brilliancy in the fire. And, secondly, because it is less fusible than alloyed gold, and may be employed with enamel more difficult to melt, and, consequently, harder and more brilliant." He also adds, that although articles of jewelry are seldom made of pure gold, yet they are, nevertheless, capable of being enamelled, provided we do not employ gold which is less than eighteen carats fine, in order that the enamel may be hard and beautiful. The enameller ought strictly to see that his gold is not of too low a quality, as the glass which forms the basis of the enamel must then always contain alkali, to render it more fusible; and which will cause it to lose its brilliancy and hardness.

Leaving these exceptions, M. Brongniart supposes a case, indeed one of the most simple in the art of enamelling; and that it is re-

quired to enamel gold of twenty-two carats fine, of a transparent blue colour.

"The artist," says he, "commences by breaking up his enamel in a steel mortar, and finishes, by grinding it in an agate one, taking care to add water, to hinder the bits of enamel from flying out of the mortar. The point at which he should stop, in the trituration, cannot be indicated, experience can only guide him therein, as certain enamels require to be reduced into exceedingly fine particles, whilst others should remain in a coarse powder. When he thinks that the enamel is sufficiently ground, he washes it, that is to say, he agitates it in clear water, and throws aside the muddy portion, which floats above the enamel precipitated at the bottom of the vessel; he continues this operation until he has thus removed all the improper powder which he finds in the enamel, and until the water in which he agitates it becomes clear, when he leaves it at rest.

"The enamel being thus washed, the artist puts it into a cup of white porcelain, with a thin layer of water above it. He then takes up the enamel with a steel spatula, and extends it upon the gold as equally as possible. As it is a transparent enamel of which we are now speaking, so we generally give to the gold a bright wavy surface, in order to afford a more brilliant reflexion through the enamel.

"The thickness of this first layer depends entirely upon the colour of the enamel. The tender colours generally require to be spread in a thinner layer.

"The enamel being laid wet upon the gold; in order to dry it, we apply upon it a fine linen cloth, which is beginning to get old. We must place this cloth perpendicularly upon the enamel, and withdraw it in the same manner.

"These operations being performed, they prepare to light the fire in the enamelling furnace; if the plate is to be enamelled on both sides, they support it upon a ring of sheet iron, so that the edges, which are not covered with enamel, may only come into contact with the ring. But if it be enamelled on one side only, it may be placed either on a sheet of iron, or a plate of crucible ware. We must also pay attention to these two particulars: firstly, if the subject is but of a small size, and not capable of being enamelled on both sides of it, we must take care that the sheet iron be perfectly flat, in order that when the subject becomes softened by the heat, it may not be warped. And; secondly, if, on the contrary, the subject be of a considerable size, and also counter enamelled, if it be possible; that is to say, that enamel can be applied upon its other surface also; that will have the power of counterbalancing the effect of the first coat in cooling, but whilst the metal is still softened by the heat. The subject then being prepared in any of these ways it is carried to the vitrifying furnace.

"When the fire is lighted, and the furnace has become red hot to the necessary degree, they dispose the pieces of burning charcoal upon the bottom of the furnace, in such a manner that they cannot fall upon the subject to be enamelled, which they place there with the greatest caution. If it be supported either upon a plate of iron,

or of clay, the artist takes hold of it with long slender spring-tongs, which are termed *reléve moustaches.* He then places the subject as near as possible to the further end of the furnace, and when he perceives that the enamel begins to melt, he turns the piece round with great delicacy and agility, in order that the fusion may be rendered uniform all over it. When, from the brilliant appearance of the piece, he sees that the fusion is complete, he quickly withdraws it from the fire. This is the most dangerous moment; as, if they exceed the proper degree of fusion of the enamel, either upon gold or silver, they are sometimes obliged to repeat the process a second time, which occasions a considerable loss.

"The piece being cooled, it must receive a second coat of enamel, applied with great care, in the same manner as before; and it must again be passed through the fire with the same precautions."

M. Brongniart next proceeds to describe those manipulations, the object of which is to remove the inequalities produced upon the surface of the enamel. This is done, he says, with a smooth English file, and water. When the file begins to wear, they add some sand. They must employ great care and skill, on the one part, to prevent the enamel from flying off; and, on the other, not to make the enamel too thin in places, which would deprive it of the uniform tint it should possess.

"The polishing of the enamelled parts is effected by means of a powder termed *terre pourrie* (tripoli,) which is a ferruginous clay, very fine, and of but little consistence; but, before using it, it must be washed over, in order to remove the siliceous parts which it contains. In order to effect this operation, it must be put into a mortar, and be ground up with about thirty times its weight of water, and the muddy part which floats must be decanted off into a proper vessel for use. In this manner the grosser and heavier parts will be left at the bottom of the mortar.

"It requires much practice and skill to polish enamel, without causing it to scale off, or to scratch it. They employ a small flat bar of tin, near the end of which they apply a little of the finely washed tripoli, and apply it to the enamel with address, and in a delicate manner; they rub the enamelled piece lightly and uniformly all over, and without removing the enamel any where. Before finishing, they give the last operation, by substituting a piece of wood, from the linden tree, in place of the bar of tin, and upon which they apply the tripoli; and they thus give the enamel that lustre and great brilliancy which it is so important it should possess."

After having thus given an example of one of the most simple cases of enamelling, M. Brongniart finally enters into other details respecting the enamelling upon gold.

"The blue transparent enamel, which we have chosen as an example of the general method of laying on enamel, is not, however, applied in exactly the same manner as others, as some colours demand much greater care in firing them. The opaque colours are those which require the least care.

"There are such a variety of transparent colours, that it is im-

possible to indicate them all; and we shall, therefore, only speak of the principal ones.

"In fact, each transparent colour requires a different gold; that is to say, gold alloyed in a different proportion; thus blue requires us to use a certain gold, whilst yellow, red, green, &c. demand gold of various other colours, it serving as the base or foundation of the enamels.

"To the changes of colour effected by these alloys of gold, we must also add those caused by the fire. These changes are most singular, and especially upon the transparent colours.

"The opaque colours are less susceptible of becoming changed; nevertheless, some of them lose by the stroke of a fire, more or less violent, their primitive colours. The opaque colour, termed *turquoise*, for instance, is subject to become sometimes black, and at other times blue, from the action of the fire. In general, the fire either scales the enamels, or renders them sandy.

"When we would enamel upon silver, we must lay it on in the same manner as upon gold; but there is a difference both in the choice of the enamels, and in the mode of firing them; and we must observe that this difference is so great, that the enamels intended to be used upon silver, must be made expressly for that purpose. The changes which the enamels upon gold experience from the action of the fire upon them, are nothing in comparison with those which we remark in enamelling upon silver.

In order to prove this, the author took a plate of gold, of twenty-two carats fine, and another plate of exceedingly pure silver, whose colour underwent no change from the action of a high degree of heat. He divided each of these two plates into eight slips transversely, and upon each kind he distributed the principal opaque and transparent enamel colours. He remarked the following effects produced upon these colours, after having supported three firings.

"The opaque white enamel remained perfect upon the gold, without alteration. But upon silver it took, at the first firing, an olive tint, semi-transparent at the edges. At the last firing, which was violent, it became nearly transparent, and he perceived waves to extend through it.

"The transparent yellow enamel underwent no change upon this gold; but it did not produce so fine an effect if the metal was alloyed in other proportions. Upon silver it underwent singular changes, which were unaccountable. It acquired, at the first firing, an opalline orange colour; and the last fire changed it to an opaque olive green.

"The opaque yellow enamel underwent no change upon the gold, but as its colour was not proper, so it became paler. Upon the silver it became of a brown colour, and had an opalline semi-transpárency.

"The transparent green enamel is one of the most delicate colours, and it would have required a differently alloyed gold to have succeeded well. Nevertheless its colour was not changed upon this metal, only it was not brilliant. Upon silver it became changed

from the first firing, as its edges were of an opaque yellow tint; but, upon the last violent firing, it lost its transparency a little. This degree of fire, however, renders nearly all other colours obscure upon silver.

"The transparent violet enamel undergoes most singular changes both upon gold and silver, and, although it was the same enamel, yet its colour was entirely different upon the two metals. Upon gold it became, at the first firing, of a transparent orange red colour; but, at the last, it acquired an opaque lilac colour. Upon silver it took at first an opaque lilac colour, and, finally, became a foul opaque brown.

"The blue enamel, of all the colours, is that which is the finest, and constantly remains the same, although the gold it is applied upon is exposed to the most violent fire. But, upon silver, it is the most changeable of all the enamels. It acquires, on the first firing, a blackish hue. But the last and strongest fire again restores its fine blue colour.

"Lastly, the black enamel is, of all colours, the most easily applied; it, indeed, assumes, upon silver, a violet tint on the first firing; but the last firing restores its colour again. It may be here remarked, that this last stroke of the fire, and which effects the changes in the enamels, must be powerful enough to fuse part of the silver.

"As to enamelling upon copper, this metal is but little used by the enamellers, on account of the difficulties which are experienced in employing the fine colours upon it; the transparent ones becoming nearly black. The opaque ones are those which can be most conveniently employed. But it must be observed that their edges almost constantly acquire a greenish tint. When the layer of enamel is too thin, or the fire is too violent, the enamels generally become black.

"We may, nevertheless, give copper a coat of transparent blue enamel; but, in order to preserve its colour, we must lay beneath it a bed of opaque white enamel; in this manner the blue may be kept apart from the copper.

"With regard to the theory of the art of enamelling, it is easy to understand it in certain cases; but others, again, present the greatest difficulties. In order that a metal should be proper for the purposes of the enameller, it is necessary that it should fulfil two conditions. First, it must be less fusible than the enamel, from whence it results that lead, tin, and bismuth, must be excluded, these metals being improper, from their great fusibility, to undergo the operation of enamelling; and, secondly, that the metal to be enamelled, should not be too readily oxidable in the fire, as this oxide, when dissolved in the enamel, changes the colour of this substance.

"The theory of the changes in enamel colours is more difficult to understand. We can, indeed, easily conceive that when the enamel upon silver assumes an opaque olive colour, it must be attributed to the oxide of silver dissolved in the enamel; and we may also conceive that when the fire is more violent, it augments the force of

this solution, changing the affinities, as well as the proportions of the mixtures, and thus it may easily change the same enamel to different colours. But it is difficult to understand how the silver becomes a little oxided by simply heating it, and that to a degree which is not sufficient to fuse it, and more especially when it is defended by a coat of glass from the contact of the air. It is of little use to say that we have removed the oxygen from the metallic oxides in the enamels, silver being one of the metals which has the least affinity with that substance. Finally, it is not easy to explain why a transparent enamel becomes opaque by the action of a too violent fire, and which also renders transparent an opaque enamel; and thus it becomes absolutely necessary to use different enamels upon gold and silver."

Important Experiments on Steam Boilers.

[From the Edinburgh New Philosophical Journal.]

We have received the following account of the experiments made with the new *Marine boiler* on Messrs. Braithwaite and Ericsson's construction. It is a low pressure boiler; and, from these experiments, it is evident that the following important advantages will arise to steam navigation by the introduction of this principle: 1. The total absence of all smoke; 2. The dispensing with the chimney; 3. A saving of at least 120 per cent. in the cost of fuel, and 30 per cent. in the space to stow it; 4. A saving of about 400 per cent. in the space occupied by the boilers. The same principle is now applying, by Messrs. Braithwaite and Ericsson, to the new locomotive engines constructing for the Liverpool and Manchester rail-way, which are to be delivered at mid-summer; and a similar combination of vast power, in a small space, with a great saving of fuel, will be applied to them.

Memoranda relative to the experiments made at Mr. Laird's works at North Birkenhead, with the new Low Pressure Boiler, on the exhausting principle of Messrs. Braithwaite and Ericsson, by Alexander Nimmo, Civil Engineer, Dublin, and Charles B. Vignoles, Civil Engineer, London.

The exhausting apparatus consisted of a fan-wheel, with broad radial leaves, revolving within a close box or chamber, placed a little apart from the boiler, but connected with it by a passage leading from the flues traversing the boiler: a short tube above the exhausting chamber passed out to the atmosphere. The furnace was attached to and placed at the end of the boiler, opposite to the exhausting apparatus, which latter being put to work, drew through all the turns of the boiler the hot air from the fire, which passed over the throat of the furnace through the bridge flue, and then successively through the other five turns of the flue arranged through the boiler, and finally was drawn through the exhausting chamber and passed into the atmosphere. The heat, which in the furnace was extremely intense, was absorbed by the water in the boiler as the air rushed

through the flues, and, when passing up the tube or funnel from the exhausting chamber, was so far cooled that the hand or arm might be placed with impunity down the tube, the temperature probably not exceeding 180° of Fahrenheit. Not the slightest smoke was perceptible. The following are the principal dimensions measured:

	Ft. In.		Ft. In.	
Furnace	2 0 deep	Ash Pit	1 0 deep	The openings of the fire
	2 6 long		2 6 long	are equal to about half
	2 6 wide		2 6 wide	the area of the bottom.

	Ft. In.			Ft. In.
Exhausting Chamber	2 6 high	Outside Dimensions	Diameter of Exhausting	
	3 6 wide		Wheel, - -	3 0
	3 6 long		Breadth of the same,	0 10

Bridge flue or throat from the furnace, 2 feet 6 inches broad, 4 inches wide, 2 feet deep, 5-16th inch iron plate.

First turn of the flue 4 inches wide, 2 feet deep; 2nd, 3d, 4th, and 5th turns, 3 inches wide, 2 feet deep. } $\frac{1}{4}$th inch iron plates.

Whole length of the flues through the boiler,	45 feet.
Superficial area of the heating surface,	247 square feet.
The contents of the water in the boiler when filled were from - - - - -	85 to 90 cubic feet.
The superficial area of the evaporating surface in the boiler, - - - - - -	33 square feet.

The proportion of the heating to the evaporating surface nearly $7\frac{1}{2}$ to 1.

	Ft. In.	
Steam Chamber	3 0 wide	containing about 65 cubic feet.
	4 10 average depth	
	4 6 long	

Diameter of the safety valve very nearly 5 inches, being 19 square inch area, which was loaded for a pressure on the square inch of 4 lb. giving 76 for the load.

Of this, 66 lb. of iron were placed in the boiler, and 10 lb. allowed as the weight of the valve, rod, hook, handle, &c. The water used was the salt water from Wallasey Pool, and filled into a large iron tank, the area of the surface of which measured $32\frac{1}{2}$ superficial feet. The boiler was placed under an open shed; the day was very cold, with thick rain. No engine being attached to the boiler, the exhausting apparatus was worked by a wheel and band from Mr. Laird's turning engine. The velocity of the circle of percussion of the leaves of the exhausting wheel was determined to be about 77 feet per second, or upwards of 52 miles an hour. Mr. Laird's engine is stated to be a four horse power. No determinate measurement was made, but the engineers present computed that the power applied to turn the exhausting wheel was equal to that of two horses. The fire being lighted, the steam was got up to 4 lb. pressure in 45 minutes, with a consumption of $2\frac{1}{2}$ cwt. of coke. The expenditure at first was 8 lb. per minute, and gradually decreased to 5 lb. averaging about $6\frac{1}{4}$ lb. per minute for getting up the steam. The steam began to rise in 27 minutes, after which the consumption of coke was little

more than 5 lb. per minute; and at this period there would have been a sufficient supply of steam to work the cylinders of an engine. The coke employed was gas coke of very bad quality, of which 3½ cubic feet weighed 105 lb., giving 30 lb. for the weight of a cubic foot, or 3000 lb. as the weight of 100 cubic feet. The same weight of St. Helen's coal (that principally used in steam boats) measures 63 cubic feet. The cost of the coke used was 8s. 6d. per ton, delivered in Liverpool; the cost of smithy coke being 25s. per ton, of which 3½ cubic feet weighs 115 lb., giving very nearly 33 lb. for the weight of a cubic foot. When the steam was up, the water in the thick glass gauge attached to the boiler standing at 7½ inches, the two men stationed for the purpose began to pump, a fresh supply of weighed fuel was placed on the floor, and the following observations were made:—at 3h. 32m. began to pump; at 3. 54m. 16 cubic feet of water were evaporated; at 4h. 12m. 27 cubic feet of water were evaporated; at 4h. 19m. 38 cubic feet of water were evaporated, and 2 cwt. of coke consumed; at 4h. 32m. 41¼ cubic feet of water were evaporated, with a consumption of 252 lb. coke. From which it appears, that only 6 lb. of coke per cubic foot of water per hour was consumed; and the evaporation of a cubic foot of water per hour being generally considered the measure of a horse power, the conclusion is, that the boiler was a forty horse boiler, and that the quantity of fuel requisite to work it is 2¼ cwt. per hour, the expense of which is 12¾d.; and as the consumption diminishes after the first hour, the expense of fuel will probably not exceed 1s. per hour for the forty horse boiler.

Signed, Alexander Nimmo, C. E.
Charles B. Vignoles, C. E.

On improvements in the Microscope. *By* Edward Thomas, late assistant engineer on the Cayuga and Seneca Canal.

The *Achromatic* Microscope is superior to all other kinds where great power is necessary. It was "first constructed [in Europe] at the suggestion and expense of Dr. Goring, by Mr. W. Tully, in the summer of 1824."* This kind has more recently been constructed in this country by my friend Alden Allen, of Boston, (who has executed them with great skill,) and by myself. I have constructed them of the double, treble, quadruple, quintuple, and sextuple forms, the two last of which are the best, when the achromatic lens is designed for the object-glass of a compound microscope.

A quintuple object-glass of mine, which is represented in section by Fig. 1, consists of two concave flint lenses and three convex lenses of plate glass. The lenses of flint glass are represented in the figure by the dark, and the plate lenses by the white spaces, O being the place of the object. The surfaces in contact are cemented with

* See "Library of Useful Knowledge," No. 21, page 46.

Canada balsam, so that the compound lens has only four *reflecting* surfaces, and in consequence the vision is much clearer. The quintuple object-glass has a larger field of distinct vision than any other *achromatic* combination that I have seen.

I have a sextuple object-glass, Fig. 2, shown in section of twice its real size, that consists of two double concave flint lenses, and four convex lenses of plate glass. Its dimensions and radii are as follows; *a* stands at the first surface, *b* at the last, and O represents the place of the object to be viewed.

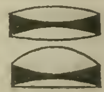
			Inch.	
Radius of	1st.	surface,	0.44	plate.
do.	2d.	do.	0.26	
do.	3d.	do.	0.26	flint.
do.	4th.	do.	0.44	
do.	5th.	do.	0.44	plate.
do.	6th.	do.	0.70	
do.	7th.	do.	0.174	plate.
do.	8th.	do.	0.26	
do.	9th.	do.	0.26	flint.
do.	10th.	do.	0.44	
do.	11th.	do.	0.44	plate.
do.	12th.	do.	plane.	

Fig. 1.

O

Fig. 2.

a



b

O

Focus of compound lens, 0.25 of an inch.
Total diameter, 0.25 do.
Clear aperture, 0.20 do.
Specific gravity of flint glass = 3.457.

The sextuple object-glass bears a larger aperture, in proportion to its focal distance, than any other that I have used; and the field of distinct vision is greater than it is in any other achromatic combination that I have examined, except the quintuple lens. It is cemented so as to have only four reflecting surfaces. Upon the whole I consider it as the best combination known at present.

The focal distance of the compound lens, Fig. 2, is one-fourth of an inch; but when the lens is used as the object-glass of a compound microscope, which magnifies two hundred or three hundred times the diameter, it will show as minute an object as can be seen with a good *single* lens of mine that has a focal distance of 0.014 of an inch, and which magnifies the diameter five hundred times.

After numerous experiments, I am satisfied, that the principal defect in the achromatic microscope, is not the colour of the secondary spectrum, as appears to have been generally supposed, but that it is what may be called the *Secondary Aberration of Figure:* which is occasioned by the spherical aberration increasing in a greater ratio, from the centre of the concave, than it does in the convex lenses. When the spherical aberration of the convex lenses equals the aberration of the concave ones, with a given aperture, I have found from experiment, that if the aperture be diminished, the aberration of the convex will be too *great* for that of the concave; and that if the aperture be enlarged, the aberration of the convex will be too *small* to counteract that of the concave lens or lenses. Were it not for this

property, which exists in all the achromatic combinations that I have examined, so many lenses as we are now obliged to use for one object-glass, (in order to have a good one,) would not be necessary. The secondary aberration of figure is not a sensible defect in object-glasses for long achromatic telescopes, though I am induced to believe that it will materially affect very short ones. This aberration might be corrected by making all the surfaces spherical except one, which should be formed by the revolution of an ellipse on its conjugate diameter, when the elliptic surface is convex. But as this is impracticable, there is no way yet known of entirely destroying the secondary aberration. It was, however, much reduced in the sextuple lens above mentioned, by making one of the uncemented surfaces as nearly elliptic as was practicable.

The achromatic microscope might be much improved, if some new arrangement of lenses, with spherical surfaces, could be devised, that would entirely destroy the secondary aberration of figure. Of this defect the sextuple lens has less than any other combination consisting of a smaller number of single lenses; because the radii of the flint lenses are greater, when the focal distance of the compound lens is the same.

I find by experiment that a more minute object can be seen in blue or purple light than in any other, provided the microscope is sufficiently powerful. This probably arises from the *rays of light having a greater magnitude*, at the red, than at the purple or violet extremity of the spectrum.*

It is not known that purple light has ever been used before for the purpose of increasing the real power of a microscope: indeed it appears to be of no sensible advantage, unless the compound lens will show a more minute object than can be seen with *any single lens.* One of my sextuple object-glasses has a focal distance of 0.07 of an inch; when this is used there is an advantage in the application of purple light, and it is believed that this combination will exhibit a smaller object than any other optical instrument hitherto made.

The superiority of this microscope over those constructed in Europe (as before mentioned,) consists, first, in its having less secondary aberration of figure; second, in having fewer reflecting surfaces; third, in having a shorter focal distance; and fourth, in the application of purple light.

A much simpler combination than the above was suggested, for destroying all the spherical aberration, by J. F. Herschel, Esq. consisting of a double convex lens with radii as one to six, placed in contact with a meniscus. It was believed that this combination would be nearly free from the errors of colour, when purple light was used, and quite free from spherical aberration. But after investigating it both practically and theoretically, I found with regret, that when the thickness of the lenses was such as is necessary to have in an object-glass of high power, that the marginal rays, (al-

* See "Library of Useful Knowledge," No. 12, p. 32; where the limit of microscopic vision, depending on the magnitude of the rays of light, is treated of by Fraunhofer.

though the aberration of figure was much reduced,) had a shorter focus than the central rays. This combination might probably be improved, when its aperture is large, by adding a plano-concave lens of the same kind of which the other two lenses are made, having its concave side towards the parallel rays, and by changing the curves of the meniscus so as to destroy the aberration of figure.

A very simple microscope, mentioned in the American Journal of Science and Arts, Vol. 17, p. 362, was proposed by Dr. Wollaston, consisting of two plano-convex lenses with their plane sides next the object, and placed at such a distance from each other as would best correct the colour. (See p. 56, of this volume.) Though this microscope has advantages, I am satisfied from experiments that the sextuple object-glass is decidedly superior.

Purple light may be obtained by causing the sun's rays to be refracted through the prism, which will sufficiently separate the colours when it is placed ten or twelve feet from the microscope. It is probable that purple light would be preferable to any other, if it could be obtained sufficiently strong; but from experiment it appears that blue light answers the purpose as well, on account of its greater intensity.

In viewing most objects with blue or purple light, it is necessary to cause the light to pass through a surface of ground glass, which should be placed one or two tenths of an inch further from the object-glass of the microscope than the object viewed.

[*Silliman's Journal.*

On the Safety of Steam Boats. *By* Professor Silliman.

The painful interest connected with this subject continues to receive occasional augmentation from the recurrence of fatal accidents. We refer our readers to some remarks in the beginning of the first article of the present number, and although they were written several months since, they are (if correct and judicious) more seasonable now than ever. The late fatal catastrophe on board the United States, steam boat of New Haven, is in some respects more interesting to the community than any one that has preceded it. This increased importance grows out of the fact that we are here deprived of the usual extenuations by which we hope to persuade ourselves that the accidents are fortuitous, and that they may not occur again. On board the United States there was a full supply of water, and the flue was not unduly heated; there was no improper pressure, and less than had been usually employed; the part of the boiler that failed was new; the commander was a veteran, distinguished for his experience, skill and vigilance, and his people were sober and faithful; still an explosion occurred which destroyed one-sixth of all the persons on board; we cannot, therefore, enjoy the consolation of imputing blame, and must charge the catastrophe to causes that may and will produce the same effect again.

In other cases we hear, indeed, that in one instance, the water was

deficient, and the flue became red hot; in a second, that the safety valve was obstructed or overloaded; in a third, that the supply tube was choked; in a fourth, that the boiler was old, and had become weak; in a fifth, that the metal, although new, was flawy; in a sixth, that they were in a strife for speed, and carried too much steam; and in a seventh, that the engineer was ignorant or intemperate, and the commander unqualified or remiss.

All these causes and others, have, doubtless, in different cases, contributed to produce explosions; but still the painful conclusion is forced upon us, that *explosions of steam boilers are produced by the energy of the power and by the weakness of the materials.* Our efforts must, therefore, be directed to the controlling and regulating of the power, and to the best use of the copper and iron, of one or the other of which the boilers are always made, and to their most judicious size, form, construction and position. This subject has recently attracted the attention of the Franklin Institute in Philadelphia, and that very useful and patriotic body has published a judicious circular, calling for exact information as to the facts that may tend to illustrate the causes and to indicate the remedies for explosions by steam. They direct their inquiries particularly to

The Boiler.—Its size, form, and relative thickness, the material from which it is made, (of copper or iron, &c.) if of iron, whether of foreign or American iron, especially in the boiler that exploded.

Safety Valve.—Its form, size, load in proportion to the thickness of the boiler, liability to get out of order, facility of repair, number used, location of the valve.

Supply of Water.—Mode of insuring a sufficiency, how gauged?

Arrangement of the Boilers in the Boat; which is less liable to accident?

Construction of the Boat—to avoid accidents in the boilers.

The very respectable names attached to the circular give us the best pledge, that a valuable report will, hereafter, be given to the public.

In the mean time, however, other explosions will occur, and other victims will be added to the great number already immolated by these thunder strokes of a power which so often proves more than a match for human skill. There is every possible motive for increased effort in improving the means of producing, managing and controlling steam; and with no view to diminish, but rather to quicken those efforts, we urge, that certainly for the present, and perhaps for ever, the safety of the community must depend upon one of two arrangements.

1. Having two boilers placed on the guards of the vessel over the water, and separated from the passengers, not only on the side,* *but every where*, excepting at the mouth of the furnace, by a bulwark made of timber, and sufficiently strong to resist, not only water and steam, but also the fragments that may be projected, or even the entire boiler should it be thrown from its bed.

* Open of course towards the water.

2. By taking a passage vessel in tow, the power being generated in one vessel, and the passengers being in another.

The first arrangement would be particularly important in such waters as are occasionally rough, where towing might be inconvenient, and at times impracticable, as on Long Island Sound, and the Chesapeake and the great lakes. To the second there seems no objection of any weight, upon waters protected from storms, and which are generally smooth; such as all our rivers and many of our bays, and arms of the sea. The excessive speed which is now aimed at, is of no importance; no reasonable man will be dissatisfied if, (sleeping and waking) he can go ten miles in an hour, which exceeds the rate of the swiftest mails in Europe, and is hardly surpassed by the fastest sailing ships of war. This degree of speed, and probably more, is attainable in tow boats, and we have thought the important suggestions of Mr. Richard Sullivan, an experienced scientific, as well as practical engineer, contained in the subjoined paper, which originally appeared in the Daily Advertiser of New York, worthy of being preserved, as containing an excellent summary view of safety barges, towed by steam boats. With him, we greatly fear that explosions will never be entirely prevented; and while several of them occur every year; while many valuable people are thus torn from life and from their friends, in a manner even more agonizing than by the casualties of war; while general anxiety pervades the community, and we *know that* (like the Parisians of late) *we are reposing over a volcano;* no time should be lost in adopting such means of prevention or of safety, as cannot fail to be in a good degree successful, at least in preserving the lives, now so often sacrificed; and the number of which will be greatly augmented whenever an explosion shall happen among the congregated hundreds, who now, *tempted by a mischievous nominal fare,* crowd the decks of many of our steam boats, so that they resemble transport ships, in a time of war, more than vessels for safety and pleasure, in a period of peace. The double remedy now pointed out is worthy of the more consideration from the proprietors of steam boats, because all those now in use, (with a great addition to their accommodations as well as safety,) can be furnished with the double boilers and the protecting bulwarks, which, to afford every possible security to their people, should be adopted, even where the safety barges are added. Then all the protection will be afforded, which the present state of our experience admits, and it will probably be sufficient, even should science and art do no more for mankind on the subject of steam; explosions will be diminished in number, because the boilers will be smaller, and more anxiously watched, and the victims, few in number, will be those who, like soldiers and sailors in time of war, encounter a known danger, and have a right to, and will obtain, a reward in some measure proportionate to the risk incurred. *The proprietors of steam boats must answer it to their country and to God, if they neglect any practicable means of defending their fellow creatures from the most awful and afflictive casualty to which the confiding traveller is exposed.* No scheme will answer which does not either remove the passengers

from the danger, or remove the dreaded boiler from the crowd which surrounds it, and from the possibility of deluging men, women and children, in boiling water—in boiling brine—in an atmosphere of over heated steam, or of destroying them by the fragments, or by the entire boiler, projected among their crowded ranks. *The boat which is first ascertained to afford absolute security will be a fortune to its proprietors.*

On the Safety of Steam Boats. By JOHN L. SULLIVAN, Civil Engineer.

Theodore Dwight, Esq.—SIR,—Your paper, and others, having given expression to the public solicitude on occasion of the late accident on board the Marshall, in reference to the future safety of passengers, it may be presumed that any suggestions to that end will be acceptable to a community with whom the inquiry may well arise, whether there can be any sure remedy for this danger?

To mention only some of its sources will enable all to answer the question for themselves.

The engineer (commonly so called) is not perhaps the person to whose negligence these calamities are chargeable, but rather to the fireman; who, besides throwing in the fuel, has to see, by the gauge cocks, that the water is kept adequately supplied. This station is extremely arduous, and he is to an unusual degree exposed to the temptation of drinking inordinately. The boiler is usually made of large diameter, and with an inside flue, which is intended to be always covered by the water. This is not the strongest form in which a boiler can be made, but is that which takes up the least room. This flue may, not only from the inattention of the fireman, but from any accidental obstruction or disorder of the supply pump, get uncovered, or the water low, when it will become red hot, soft, flexible, thin, and weak; and as this part of the boiler is out of sight, this may happen (to a degree short of giving way) frequently in the course of a season: and although the proper quantity of water may be presently regained, still the hidden weakness thus caused remains, and may show itself fatally at some subsequent period. If it were asked, how is the thickness of a boiler in all its parts, after being some length of time in use, ascertained to be sufficient? The usual method is to strike it with a hammer, wherever accessible, trusting to the indications given by the sound of the blow. In the making of boilers, it is possible that the plates may have flaws not quite obvious enough for their rejection, and it is not uncommon for rivets to break by the expansion of the metal, if not made of very good iron. Boilers may be kept in use too long, when the business is not very profitable. It is an expensive job to displace them for repairs, and it is natural to defer it as long as may be safe. Steam boats are sometimes sold at auction, to close a concern, when although the age of the boiler may be told, its condition cannot be so easily known.

It is commonly supposed that the safety valve is an effectual safe-

guard; and it is so, in a well made and well managed engine. The intention of it is to allow the steam to vent itself when it gets so strong as to lift the weight hung upon the lever of the valve. But it has been known to be fatally overloaded. Besides it is not calculated to give passage to a great and sudden increase of steam. And such sudden and great increase may happen when the flue has been long enough bare to get red hot, and water is suddenly restored in sufficient quantity to receive its accumulated heat. It is well known that water boils at 212° of Fahrenheit. But it is not so generally known that after this degree of heat, every additional 30 degrees, doubles and redoubles the expansive force of the steam, and that it requires very much less fuel and time to produce this 30 degrees more heat, than to produce the preceding 212°.

As explosions have not been confined to high pressure engines, and as the effects have been so tremendous, it has been supposed that the red hot iron of the flue must sometimes decompose a portion of water into its constituent gases, (hydrogen and oxygen.) But it does not seem to be necessary to resort to this supposition to account for the effects, if we consider the amount of the force suddenly liberated by the disruption of the boiler. It must be equal to the outward pressure on a square inch of the safety valve, perhaps never less than 20 lbs., multiplied by every square inch of the internal surface. The displacement of the boiler with such surprising violence may be accounted for from the recoil or reaction of the force from the first considerable resistance it meets with; as well as by the expansive force in the direction it takes. Thus when the Hoboken boat exploded, I am told the boiler was thrown upwards—the rupture being at the under side. That of the Helen M'Gregor being towards the stern, the boiler went overboard through the bow of the boat. Had the forward end burst, it might have been thrown as far as the cabin. The boat may be so injured as to immediately sink—the force driving some part of the machine through the bottom or side; or the shock may start the planking. In two instances the boat has sunk. The danger of this must be greater when the boilers are below, than when on deck.

Every one will admit that it will be for the interest of owners, masters, and men, to take the utmost care. But the danger is inherent in the nature of the power, and it is greater than that from negligence. One fact alone proves this: that the safety valve has not been a sufficient protection in either of the melancholy instances of explosion that have taken place. What is the inference? It must be that the boiler, though up to that time strong, has some how become too weak to bear an expansive force below what it was intended to contain; or else that somehow that force has become suddenly so great that the safety valve cannot give vent to the steam.

If then there can be no perfect assurance of safety in steam boats, and so far as depends on fidelity and judgment, much confidence must be reposed in individual labourers, there can be no safety but in keeping out of the reach of the explosion, should it happen; but this can hardly be done, if in the same boat. My opinion, long since formed, and the occurrence of so many accidents—the increase of

travel, and the number of steam boats employed, and the circumstance of their growing old, like other machines and vessels, prompt me to remind you of your being, some years ago, on an arbitration between the late Mr. Fulton and myself, to settle the question which of us had first originated the improvement in steam navigation, of separating the load from the power—the passengers from the danger. Had the award been in his favour, this method would probably have been then carried into practice; but being in mine, the exclusive privilege granted by the state to the North River Company, prevented. Yet I have the satisfaction of knowing it had the approbation of that distinguished leader in the art of steam navigation, and I now with pleasure see it in successful use for commercial transportation on the Hudson. But the attempt to carry it into effect for passengers, made with the steam boat Commerce, two years ago, was too feeble; she having no more power than is usual in boats of her class for their own impulsion.

The original design was to appropriate and devote the *leading* boat to the power, and to employ more than is usual for one boat; ample room on board permitting this conveniently, and of using the strongest form of boiler. The *follower* is attached to the leading boat, at a suitable distance, and in a manner that allows of steady motion; and being of a light, sharp construction, with one deck, the resistance of the water and air will be but small; indeed, it is the most favourable plan for great speed. It is yoking the gigantic powers of steam to a floating car, and driving them fearlessly along the liquid plain. There is also economy in this plan of operation. Fuel is the heaviest item of expense. The use of *anthracite coal* in steam engines, is a desirable improvement in their management. Hitherto, the difficulty was in augmenting and diminishing this kind of fire at pleasure, in boats. It required a peculiar form of furnace. I mention it because it will afford a sufficient degree of protection against excessive competition, should the state of public feeling positively require, in future, this perfectly safe conveyance.

It is not probable that the memory of the late accidents will pass away, as others have, with only a transient impression of their horrors. The danger has at length come near. Every boat to and from this city bears the connexions and friends of some of us. Were it simply a question of benevolence, or of some public improvement, it would be carried by acclamation. But there is one difficulty in the way. It is *considered a branch of business*, in which the public has no more concern than in stages. It is left to the enterprising in its line, and all trust that competition will produce perfection, as well as cheapness. And it might be left to ordinary competition, were it not a question of life. It is, in this respect, quite different from all other branches of business. It is a concern belonging to the public, as well as to the owners of the boats, and yet its defects and dangers are not of a nature to be prevented or guarded against by any law. Nothing but a determination of the community to have and sustain safe steam conveyance, will avail.

This branch of enterprise has taken the form of rivalry, in splendour and rapidity, and these admirable qualities will still command

an ample share of business. But, however admirable, they do not compensate for the risk of life. Why should not the public be also entirely satisfied on this point, and have the choice, at least, of safety. This improvement remains to be made, and superadded. Knowing its practicability, and the excellent accommodation of which this method is capable, it seems incumbent, at this time, thus to bring it into view. If its suggestion meets with approbation, a company may, perhaps, be formed, with sufficient capital for two equipments, one to proceed every day from New York to Albany. The passage may in this manner be accomplished, it is thought, in ten hours.

As travel is always increasing between these cities, and as a rational preference would be given to a commodious yotte, (yacht) drawn swiftly and steadily along, there seems to be some reason to expect the concern would be profitable. But the prevailing opinion may be, that it cannot be said to be certainly an object of speculation, or a source of profit. Perhaps the undertaking must rest alone on the basis of philanthropy and public spirit. If, then, on this ground, the prevailing sentiment of the community is favourable, perhaps it will be manifested by an ample capital, subscribed in moderate sums, especially should it meet the approbation of those who assemble daily at the banks and public offices, and to administer the city government. It is a measure of self-defence.

Submitting the subject thus to you, sir, for a place in your paper, I am, very respectfully, your humble servant,

JOHN L. SULLIVAN, Civil Engineer.

Patterson, N. J. 29th April, 1830.

[*Silliman's Journal.*

Strength of Wine and other Bottles.

M. COLLARDEAU has constructed a machine for the purpose of trying the strength of wine bottles. It has been presented to the Académie des Sciences, and reported upon by MM. Hachette and D'Arcet. The bottle to be tried is held at the neck by means of a lever, having three branches, which grasp it below the ring; being then filled with water, it is connected by means of pipes, with a forcing pump, the pipe having a cap furnished with leather, which is firmly held down by the apparatus upon the mouth of the bottle; the pressure upon the parts here increases with the pressure of the water within the bottle. Besides the pump, levers, and connecting pipe, there is also a manometer connected with the interior of the bottle to show the pressure exerted. When a bottle is burst in this way by the hydraulic press, no violent dispersion of its parts takes place, unless, indeed, in place of being *filled* with water, a portion of air is left in; then when it breaks it flies to pieces, and would cause danger if exposed.

Bottles intended for the manufacture of brisk Champagne or Burgundy, being tried, were found to break with a force between 12 and 15 atmospheres, exerted from within, outwards; a few rose to 18 atmospheres. Bottles which had contained Champagne of the

finest quality, broke at the same pressures. Bottles which resisted the pressure of 12 atmospheres, usually broke with one or two atmospheres more, but the number of these was small. The fracture of bottles in the manufacture of brisk Champagne is from 10 to 20 per cent.; and in certain cases, which, however, are rare, almost the whole have been broken. It appears quite certain, that during the fermentation of the wine, the pressure rises above 12 atmospheres, but the full extent can be ascertained only by careful experiments made by the wine proprietors.

The commissioners then remark, that the best bottles intended for brisk wines are too weak; the general fault is want of strength and uniformity in the belly of the bottle, especially at the junctions with the neck and with the bottom.

As the greater number of bottles for brisk wines are of the same quality, it becomes a question why some should break and others not. This difference is supposed to depend upon the form of the neck and quality of the cork, allowing a little gas to escape in some cases, and not in others. If the bottles and corks were all alike, all those which contained the same liquor at the same temperature would probably break at the same pressure. The only means of avoiding fractures is either to make the bottles sufficiently strong, or to allow a little escape of gas by the cork. The least thickness of glass in the belly of the bottle should be 2 millimetre (.079 of an inch,) but generally it is only 1 millimetre at the part next to the bottom.

[*Bull. Univ.*

Remarks by the EDITOR, *on* C. P. SAKMEISTER's *defence of his patent Piano Forte, page* 335.

THE pages of our Journal are open both to attack and defence, when the arms of the combatants are not directed against persons. We had rather give an hour to the correction of an essay written by an unpracticed hand, than a minute to the rounding off the asperities of an angry writer. Should "A Manufacturer" choose to reply to Mr. Sakmeister, we see no benefit to be derived from his giving his own name, although we have no objection to his doing so, provided personalities are avoided; we do not perceive, however, that it is required by the matter in dispute. When a man takes a patent for an invention, which he claims to have made, his right to the monopoly is a question in which the public interest is deeply concerned, and every individual has a right to examine into the validity of his claim. One of the great objects of this Journal is to place before the public the facts which go to establish, or to impeach, the rights of patentees, and whether these be furnished by Mr. Sakmeister in his own name, or anonymously by "A Manufacturer," their value will be estimated by their intrinsic worth, and not by the signature which accompanies them.

We know that it is no pleasant thing for a man to have the justice of his claims questioned, but as every claim to a patent is a questionable one, it must either not be set up, or the consequence of

doing so must be borne. We should prefer to witness the triumph of Mr. Sakmeister in our court of inquiry, the Journal of the Franklin Institute, than in a court of law, where, in most cases, the contest terminates in loss to both the belligerents.

RECLAMATION.

Cast Iron Wheels, with Wrought Iron Spokes.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

In the number of your Journal for June last, you speak of a mode of casting wheels with wrought iron spokes, "*adopted by Mr. Perkins,*" and in your number for June, 1827, you published an extract from the Technical Repository, stating this mode to be the invention of Mr. Perkins. Mr. Perkins is certainly not entitled to the credit of the invention, for the writer of this article communicated it to Mr. Perkins, in London, in 1826, as the mode practised at Mauch Chunk, in making iron wheels for the wagons at that time used on the turnpike for conveying coal to the Lehigh, and Mr. Perkins had not known it previously. He no doubt communicated it to the editor of the Repository. H.

Philadelphia, July 3d, 1830.

On referring to the article in our number for June, 1827, the method of casting was, it appears, communicated by Mr. Perkins, but it is not stated to be his invention; it, however, appeared to be a fair inference that such was the case, and under this impression it has been so treated by us. It now appears that we were mistaken, and as we wish "honour to whom honour is due," we willingly insert the reclamation of our respected correspondent.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Query. Gum Seed Lac. Shell Lac.

Mr. Editor,—Your correspondent desires to introduce to your notice the above articles, which are very extensively used in the manufactures of the United States for various purposes, viz. for stiffening hats water proof, for varnishes, for sealing wax, &c. and inquire through the medium of your Journal the relative value and properties of the two articles, as adapted to the above or any other purposes, and the modes of using them. It would doubtless much advance the manufactures of our country if the nature, properties and uses of prominent materials were more fully understood, and prevent much loss of time and money in fruitless experiments, by unskilful artists, and dissipate many prejudices created by ill success.

No doubt, among your numerous correspondents, there are those who are able and willing to add to the stock of useful knowledge disseminated by your valuable Journal; perhaps those in the constant use of the article would enlighten us in their respective application of them, and a mutual benefit be derived by

Many Manufacturers.

November 16, 1830.

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

DECEMBER, 1830.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN OCTOBER, 1830.

With Remarks and Exemplifications, by the Editor.

1. For an improvement in the construction of *Fulling Mills and Power Looms;* Anson Atwood, Salem, Washington county, New York, October 1.

The beaters, or hammers, of this fulling mill, are of the usual construction; are suspended, and swing, as in other fulling mills; but the lever, or rods, by which they are carried backwards and forwards, are not acted upon directly by a crank, but have a joint in them near their middles, working like a rule joint. Cranks placed above these rods, raise and depress them by means of pitmen, and thus cause the hammers to vibrate; one end of these compound levers is fastened to the hammer, and the other works upon a pin in the frame behind it.

We do not perceive the advantage of this arrangement, but will let the patentee speak for himself; and he says, "the advantages of this improvement are a gain of power, and a more gradual and equable motion of the hammers, better conducing to the fulling of cloth; also a diminution of expense, in crank, and gearing, and repairs."

The same kind of joint he proposes to apply to the power loom to act on the lathe in beating up, which is to be advantageous, "by giving two blows, instead of one." The claim is to "the application of a compound jointed lever, or the 'engine of oblique action,' to a fulling mill and power looms."

2. For a *Lamp Reflector;* Edward Brown, Dover, Strafford county, New Hampshire, October 1.

The patentee undoubtedly thinks this a new thing over a lamp, although there is "no new thing under the sun." We will endeavour to enable our readers to judge between him and the first Solomon.

This lamp reflector is to be made of tin, or other polished metal. Its form is to be that of "a tin liquor tunnel." This conical reflector is to be suspended by its apex, and the lamp hung under its centre, by which means the light will actually be reflected downwards. The reflector may be fluted, if that form is preferred. The *novelty* is not pointed out; as there is no claim, the patentee "goes for the whole" reflector.

---

3. For an improvement in the *Springs of Door Locks, and other Locks, by means of Elastic Wire,* called "The Wire Lock Spring;" Job Baker, New Bedford, Bristol county, Massachusetts, October 1.

A piece of iron, or other wire, which may be about one-eighth of an inch in diameter, is to be substituted for the flat steel springs now in use. This wire may have two, three, or more spiral turns, where the screw fixes it. It is proposed not only to substitute this for the common spring to the spring bolt, but also to make it act the part of the spring and tumbler to the lock bolt. For this purpose one end of the wire is to pass round the inside of the box of the lock, so as to bring it under those notches in the bolt into which the tumbler usually catches. To secure its falling into these notches, the wire is to be bent up at right angles. A part of the wire is to have a round bend, in order that the key, as it turns, may touch it, just as it does the curved edge of the common tumbler; the key will thus lift the wire out of the notch and allow the bolt to be advanced, or withdrawn. The claim is to the use of wire in the way above described.

As respects the use of wire to act upon the spring bolt, although it may never have been patented, we know that it has been used, as we have employed it ourselves, in our domestic repairs, and we have no doubt that others have done the same. We apprehend that it is one of those contrivances to which any maker of mouse traps, or other worker in wire, would be apt to resort, should he undertake to repair the spring of his own door lock. We have for the same purpose used a piece of whalebone, which has continued to act well for years; we, however, have not taken a patent for it.

For the spring and tumbler, the wire is a poor substitute, as the bolt may readily be forced back, because it is retained in its place merely by the bent wire, which acts only as a spring, and will easily give way.

---

4. For *Machinery for Hulling and Cleaning Rice, and Coffee, and for Trip Hammers, Powder Mills, Washing*

Cloth or Clothes, and for Pounding any kind of Ore or Stone, and for Pounding and Mixing Mortar, for Making Brick, or any other use; Joseph Beach, Middletown, Middlesex county, Connecticut, October 1.

Twenty-five mortars are to be set round in a circle of twenty-nine feet in diameter. The pestles are long vertical pieces of timber, sliding up and down through mortises. These are to be lifted by levers, which converge towards the centre of the circle. By a vertical shaft, four wheels are carried round upon horizontal shafts, which, as they roll, press upon the inner ends of the levers, and thus raise the pestles. These wheels are made wide, that the inner part of their peripheries may be supported upon a circular platform, or rail-way, whilst their outer edges, projecting beyond the rail-way, operate upon the levers. The mortars are made in the shape of an egg with the lower end cut off for a small distance; these mortars rest upon suitable blocks, and their upper ends are, of course, open, to admit the pestles.

It is proposed to make longitudinal slits from the top to within six inches of the bottom of these mortars, to allow the dust formed in the pounding to escape. When mortar is to be mixed, ores pounded, or trip hammers worked, the proper troughs or anvils are to take the place of the mortars.

The claim is to "the mode of applying the power by means of wheels to the levers, and the combination of the various parts of the machinery as aforesaid, in such a manner as to produce the result."

The longitudinal slits, and the shape of the mortars, when applied to the cleaning of rice, seem to trench upon Mr. Ravenel's patent, referred to in a note, p. 317, in the last number. In the English patent, on the same page, these longitudinal slits are mentioned. Their effect is the same as the wire work in Mr. Ravenel's mortars, and any claim to them by any person informed upon the subject, would, manifestly, be an attempt to evade his patent.

---

5. For a *Purcussion Lock, and Vent for Cannon;* Lieut. William H. Bell, Fortress Monroe, Virginia, October 1.

We are not aware of what constitutes the peculiarities in this lock, when compared with others which have been used for the firing of ordnance; as, excepting in the mere arrangement of the parts, we do not think that it is new. The vent is countersunk to receive the primers, upon which the hammer is to strike. The hammer face is of steel, and made to fit into the countersink. The hammer handle projects back, and is supported upon a joint attached to the breech plate. The tail of the hammer is held down by a catch, and, when this is released, a spring, attached to the cascabel by means of screws, forces it down.

The vent is not placed on the top, in the usual manner, but is removed towards one side, so that the sight is not obstructed.

As all the parts are described, without particularizing those which the present patentee has invented, the whole patent may be en-

dangered by this neglect. Thus the countersinking of the vent, to receive the primer, stands as conspicuously as any other part of the arrangement. Is this new?

---

6. For a water wheel, and the manner of applying the same to the *Propelling of Canal Boats, and other Water Craft;* Henry Ovinel, Richland, Oswego county, New York, October 1.

The mode of propelling proposed in this patent, has been so often noticed in this Journal, and its utter uselessness set forth, that we need not take up more space on the present occasion than what is merely necessary to a brief description of this re-proposed plan. Spiral screw wheels, or shafts, are to be placed in tubes on each side of the boat, or under its centre. The tubes are to extend nearly from stem to stern. It is proposed to make the tubes about a foot in diameter, with the revolving screws nearly filling them. There is no claim either to the wheels, shafts, or tubes.

---

7. For an improvement in the *Machine for Cutting Crackers, Sugar and other Biscuit,* for which a patent was obtained on the 16th day of March, 1830, which patent is cancelled on account of an incorrect specification; Thomas Bladen, Philadelphia, Pennsylvania. Re-issued, October 1.

"The invention here claimed is the mode of forcing a portion of the dough through the bed plate, as before described; the adaptation of spiral springs to the raising of the cutters; and the making of the set of cutters out of a solid piece of metal."

There have, of late, been so many improved machines for cutting crackers and biscuits, that we cannot attempt to analyze their respective claims to superiority; and we apprehend that most of our readers are more concerned about the machinery for grinding crackers after they have been made, than for that which the baker employs in forming them. The present specification appears to contain a description of some new parts, substituted for those used in the first instance; in this case a new patent ought to have been taken for an improvement upon the machine patented in March last; otherwise something more is done than merely inserting what was omitted, or omitting what was inserted, through inadvertency.

---

8. For *Wheels, Pinions, or Movements for Clocks,* made of glass, instead of the substances or materials which have been heretofore employed; John P. Bakewell, Pittsburgh, Allegheny county, Pennsylvania, October 1.

(See specification.)

---

9. For making *Conduits for Conveying Water or Gas under Ground;* John M. Benham, Bridgewater, Oneida county,

New York; first issued August 9th, 1827, cancelled and re-issued with a corrected specification, October 1st, 1830.

What is intended by correcting an erroneous specification, seems, in most instances, to be altogether misunderstood by patentees. We have rarely compared the new with the cancelled specification, without finding them essentially different in their purport; and such, we think, is the case in the present instance.

The original patent stated the improvement to be "in making aqueducts for conveying water, or gas, under ground by means of a conductor formed of water proof lime, *as a cement for stone, wood, or brick.*" In the claim appended to the new specification, the patentee says, "I claim as my discovery, invention, and improvement, that conduit pipes for the conveyance of water, or other fluids, may be *made of water lime cement alone*, of sufficient firmness, strength and durability, to answer a most valuable purpose." In the former specification it is said that the grounds upon which a patent is claimed, is the discovery of using "water proof lime as a cement for cementing stones, or brick, or wood, or for moulding this lime into aqueducts for the carrying of water or gas under ground."

That which originally appears to have been introduced as a mode which *might* be occasionally adopted, forms the exclusive object of the present patent; whilst that which was the main design of the former is not even mentioned in the new specification.

The mode of procedure now prescribed for forming the conduits, is to place, in the trench that has been prepared for the purpose, a quantity of mortar, made of water proof lime and sand, and upon this to lay a cylindrical mould or core, which is then to be covered with the same kind of mortar; when this has hardened sufficiently, the core is to be drawn nearly out. The extreme end of the core is to be made of leather, or other flexible material, stuffed to make it preserve its cylindrical form, but flexible for the purpose of allowing the core to turn up out of the way whilst laying a new bed, and also to admit the turning of corners.

---

10. For *Saccharifying Rye and other kinds of Grain, &c.*; A. J. Brasier, Philadelphia, Pennsylvania, October 1.

(See specification.)

---

11. For *Saccharifying Rice and Maize;* A. J. Brasier, Philadelphia, Pennsylvania, October 1.

(See specification.)

---

12. For an improvement in the *Thrashing Machine;* Robert L. Caustin, Ledyard, Cayuga county, New York, October 1.

The general structure of this machine is the same as those most ordinarily employed, but instead of the common beaters upon a cylinder, there are six round rods of iron, passing from one head of the cylinder to the other, and upon these are to be placed short iron

flails, which the patentee calls teeth. The teeth are to play freely upon the rods, are to be about three inches in length, and round, square, or oval, as may be preferred.

"The inventor claims the right of every modification of said machine, which shall be consistent with the hanging and playing of the teeth as above described."

There is already a patent in existence for hanging short flails to the revolving cylinder of a thrashing machine. The mode of hanging differs from that described above; and if the patent is to be considered as confined to this mode, they may not interfere. The one to which we allude is upon some of our published lists, but, at present, we must leave to those interested, the task of hunting it out from among the numerous machines for thrashing grain.

---

13. For the *Construction and Application of Friction Rollers;* David Baldwin, Queensbury, Warren county, New York, October 1.

(See specification.)

---

14. For a *Hill Side Plough;* John P. Cobbs, Nelson county, Virginia, October 1.

The mould board of this plough is made of the same form on each side, in order that it may be capable of turning the sward either way. The mould board and share are attached to the beam of the plough, by means of an iron rod, which runs down, vertically, through the beam, the mould board, and the share. This rod serves as a fulcrum to the mould board and share, which are to be shifted at every return of the plough on a hill side, so that the two sides of the plough may alternately operate as land sides. Behind this rod, a bolt or key passes through the beam, which falls into mortises on the upper side of the mould board, in order to secure it in the different positions required. The bolt is kept in its place by a spring, which must be raised every time the mould board is shifted.

There are some other appurtenances which are described and claimed, but the principal are "the heel bar, the key, and the general arrangement of the several parts of the plough, and likewise the mode of changing the position of the mould board, as before described."

---

15. For an improvement in *Ferry Boats, and in Propelling the same;* Matthew D. Brown, Mason county, Virginia, October 1.

A rope, or wire, is to be stretched across a river, in the way common at many ferries. Skiffs are to be moored in the river, to support the rope or wire; each skiff is to have a mast in its centre for this purpose. The ferry boat has stancheons, and pulleys for the rope to pass over, and a rigging rope, with a ring, by which it is attached to the crossing wire, or rope, so that it may stand obliquely

with the current. A lee board is to be lowered and raised by means of a windlass, according to the depth and strength of the current.

"The invention here claimed is the fixing a long rope, or wire, on one side of a river or stream, and holding up the rope or wire by means of floats; the mode of raising and depressing the lee board; the mode of steering the boat; and the ice breakers."

The general plan, if we understand the description, is a very old one; if there are any particular improvements rendering the mode of applying this principle more efficient or convenient, they are either very imperfectly described, or we so perfectly in the dark as to be unable to perceive them.

---

16. For a vegetable *Specific for the Cure of Ague and Fever;* Maurice Cannon, City of New Orleans, Louisiana, October 1.

"Take of Tinct. Cardamon,	2 oz.	
Tinct. of Gentian,	2 oz.	
Tinct. of Capsicum,	1 oz.	
Tinct. of Snake Root,	$2\frac{1}{2}$ oz.	
Winter Green Water,	1 oz.	
Aromatic Tinct. of Vitriol,	2 drs.	Mix and add to the above.
Sulphate of Quinine,	20 grs.	

Grown persons must take one table spoonful of the above in double the quantity of lemonade, sangaree, or cold water, every hour. It will be necessary to commence ten or twelve hours before the usual time of the chills coming on, so as to have the desired effect the first day; and when it only comes on every second, or third day, it will be necessary to commence 18 or 20 hours before the usual time."

This compound resembles the greater number of empirical, and patented medicines; a list is procured of articles said to have cured a certain complaint, the materials upon this list are jumbled together, and it is apprehended that if one of them fails, the other will hit the disease on the head. Like most quack medicines, it may acquire popularity, because it will frequently cure the disease; whilst the cases in which it may do harm from its indiscriminate administration, will remain unknown, no certificates in such instances being sought for, by the venders of panaceas.

---

17. For a *Floating Graving Dock*, to be used in building or repairing of ships, steam boats, and other craft, called the "Pittsburgh Floating Graving Dock;" Thomas Cunningham, Pittsburgh, Allegheny county, Pennsylvania, October 1.

This floating dock is proposed to be made 140 feet long, 34 feet wide at the bottom, 36 at the top, and 10 feet deep. These dimensions may, of course, be varied according to circumstances. When the dock is to be used, the water is allowed to enter it, so that it may sink at its moorings, and admit the vessel which is to be repaired to float in. A gate at the stern is then raised to enclose the vessel,

and the water is to be pumped out, care being taken to support the vessel's keel with proper blocks, and her sides with shores.

Directions are given respecting the size of the timbers, the knees, and the thickness of the plank; but we are not told what there is in the structure upon which to found a claim to a patent.

Without travelling abroad, to learn what has been done in other countries, we refer our readers to the detailed report of a committee of the Franklin Institute, on Commodore Barron's floating dock, at page 3, vol. iii. of the Franklin Journal, first series; and to another report in the same volume, p. 424, on a floating dock, invented by Edward Clark, Esq. civil engineer. We think that a perusal of these alone would suffice to convince the patentee, that if a floating dock is patented, he ought to tell in what particulars that which he claims to have invented, differs from those which have been before known.

---

18. For *Extracting Cream from Milk;* Samuel Davis, City of New York, October 1.

The specification of this patent is in but few words; we therefore give it entire, as follows.

"This improvement consists in putting zinc, commonly called spelter, into the vessel, or reservoir, containing the milk, or in depositing the milk in pans, or vessels composed of the aforesaid mineral, which decomposes the acrimonious substance that causes the milk to become sour, or rancid. And the same quantity of milk or cream will yield a greater quantity of butter, and of a much finer flavour."

"What I claim is the manner of using the mineral called zinc, or spelter, in the reservoir, or vessels, containing the milk; and preparing vessels, or pans, from the zinc, or spelter.

SAMUEL DAVIS."

We believe this application of zinc to be really "new," whether we may add "and useful," we very much doubt. We cannot conceive of any action which can be exerted by the zinc, in an earthen milk pan, or of any which can take place between it and the milk, unless the acid of the milk, as it is formed, dissolves a portion of the metal, and in this case a poisonous salt will be formed. Zinc is among those metals which are most readily attacked by acids, and all its soluble salts are deleterious. If the effect is as stated, namely, that the milk containing the zinc will not become sour, or rancid, we know of no way in which this can be explained, but by the formation of a metallic salt.

---

19. For a *Rail-road Car;* John Elgar, Baltimore, Maryland, October 1.

(See specification.)

---

20. For a *Topping to Chimneys for the purpose of prevent-*

ing them from Smoking, called a "Ventiduct Topping;" Joshua Ennis, Brooklyn, Kings county, New York, October 1.

The specification of this patent is a specification of nothing, as it does not pretend to give any description of the thing patented, but seems to suppose that its nature will be known by intuition.

We are told that the *improvement* may be made of stone, brick, wood, or metal. The *standards*, we are informed, may be three and a half inches square; but what these standards are, where they are to be placed, and what end they are to answer, the deponent saith not. The description of every other part is in the like "full, clear, and exact terms." As there is not any thing described, the trouble of making a claim was completely avoided.

The drawing which accompanies this anti-specification, consists of a few parallel lines, like those of ruled music, with vertical lines resembling the bars by which the notes are divided, and is without letters of reference, or explanation.

We are told about a model in the office, which model, we suppose, is left to speak for itself, as the testimony of the written instrument says nothing in its behalf.

---

21. For a mode of *Preventing Water, and Cold, from passing under outer doors;* Samuel Durfee, Providence, Providence county, Rhode Island, October 1.

A sloping board, such as is frequently employed as a fender, is fixed at the bottom of the door by means of hinges, which allow it to raise out of the way of the sill. There is a spring beneath the fender, which, acting upon it, tends to lift it up. A pin is driven into the door sill, near to the hinge side, and, as the door closes, this pin presses against the spring and relieves the fender from its action, which then falls by its own gravity. Above the fender a moulding is planted, which serves to throw the water from the door, on to the fender, and thus to prevent its running down through the hinged joint.

The claim is to the manner of fixing the spring, and to the moulding across the door.

---

22. For *Machinery for Pressing;* Lecter E. Denison, Saybrook, Middlesex county, Connecticut, October 1.

The follower of this press is to be forced down by the action of two eccentric cams upon the same shaft. One of these cams bears against a friction roller attached to the upper rail of the press frame, and the other against a similar roller attached to the follower. When the shaft upon which the cams or eccentrics are fixed, is turned by means of a lever, each eccentric operates in forcing the follower down. It is proposed sometimes to form teeth upon the cams, and on the friction rollers, in which case the lever may be applied to either of the friction rollers, instead of to the eccentric, as they will then operate as pinions.

The claim is to "the application of two or more eccentric cams, or pieces, to operate as above specified, thereby doubly increasing the distance of motion, without increasing the size of the eccentric pieces. And the right of attaching cogs to the eccentric cams or wheels, or on the rollers, or pinions."

Presses to work by eccentrics have been before patented, but the mode of applying two eccentrics in the manner here described we believe to be new. As no power will be gained by this arrangement, and it is more complex than a single eccentric, we do not perceive what advantage is offered by the proposed plan.

A good drawing accompanies the specification, but it is without written references.

---

23. For a *Machine for Scouring Floors;* David Dickinson, Chatham, Middlesex county, Connecticut, October 1.

This *machine* is a contrivance for working a scrubbing brush backwards and forwards by a lever operating in the manner of a pump handle. A flat board is to stand upon the floor, and from this is to rise two uprights, to sustain the pin which is the fulcrum of the lever. To the lower end of this lever the scrubbing brush is to be attached by a joint. The board, with its appendages, is to be moved about the floor, that the brush may be applied to every part of it, &c. &c. &c.

We have seen many machines, some of them white, some yellow, and others black, which worked scrubbing brushes to admiration. Some of them were very clever looking articles, and, although unpatented, we should decidedly give them the preference, either for washing, scrubbing or other useful operations in domestic economy. They may be either hired, or purchased, as may be thought most convenient.

---

24. For a *Churning Machine;* Philip Cornell, Brutus, Cayuga county, New York, October 1.

The churn is in the form of the common dasher churn. This is to be placed upon a platform which has an upright to sustain the machinery that is to work the dasher shaft. A crank is to be turned, which operates upon a wheel and pinion. To the shaft of the latter is attached a cast iron fly wheel, and a crank pin to raise and depress the dasher. There is no claim made, but we are told that this churn "is a great labour saving machine to all those who keep large dairies."

---

25. For a *Rotary Steam Engine;* Ezekiel Childs, Philadelphia county, Pennsylvania, October 1.

In this engine the steam is to be admitted and discharged through the centre of the revolving shaft, in a way which has been frequently adopted. The steam, also, operates upon a piston revolving in an annular chamber precisely like several other rotary engines. The two valves which are to confine the steam, are sliding valves, which

operate very much like those of Galloway's engine, patented in England, but their whole structure, with the mode of working them, appears to be more perfect. We do not believe that this machine will be found equal to the ordinary reciprocating engine, although we think more favourably of it than of its predecessors. Those, however, who have read our lucubrations, are aware that we estimate rotary engines, generally, as very unpromising affairs. In choosing a model for the purpose of explaining the structure, or testing the power of a rotary engine, we have not seen one which we should prefer to that of Mr. Childs'.

---

26. For an improvement in George Danforth's machine for *Making Cotton Roping*, called the "Counter Twisting Speeder," for which a patent was granted to said Danforth, dated the 2nd day of September, one thousand eight hundred and twenty-four; Joseph C. Dyer, a Citizen of the United States, but now residing at Manchester, in England, October 1.

The attempt would be vain to communicate any useful information respecting this machinery without several copper-plate engravings. Whether these will be furnished hereafter, must depend upon the patentee.

---

27. For an improvement in the construction of a *Water Wheel for Propelling Machinery;* James Johnson, Fairbanks, Sullivan county, Indiana, October 1.

This is a wheel with hinged buckets or floats, but differently arranged from those which we have previously described. There is an axis carrying a solid hub, with spokes projecting from it, like the spokes of a carriage wheel. Each bucket consists of two pieces of plank, hinged to these spokes like shutters. The wheel is intended to be used in a current, and to be placed with its axis either vertically or horizontally. On one side of the axis, the current will tend to open the shutters, and expose their broad sides to its action, there being stops to prevent their opening beyond the point in which they both stand in the same plane. The opposite buckets will be closed by the current, and their edges only exposed to the water. The claim is to "the whole wheel above described, the shaft only excepted."

Hinged buckets have been tried in almost every possible variety of form, and have, hitherto, always disappointed the hopes of their projectors. The hinged buckets pass far beyond the point at which they *ought to open*, according to the opinions of those who construct them. We do not see any thing in the wheel now proposed which should give it a superiority over others of the same genus; but think it really inferior to several which have had an ephemeral existence; in this last particular we apprehend that the one under consideration will not shame its predecessors.

28. For an improvement in the *Art of Digging and Procuring Gold from the Mine*, by the use of a machine; Henry Jordan, Oglethorp county, Georgia, October 1.

A bolter, covered with wire work, receives the earth to be washed; this wire grating retains the stones, and larger masses, whilst the smaller pass through the meshes. These are received in a hollow cradle, sometimes called a rocker, forming about a quadrant of a cylinder, and which is placed immediately below the bolter. To this cradle a vibratory motion is given by means of a crank, whilst a stream of water is conducted upon its contents, to wash off the lighter particles, and leave those of the gold behind. From the rotary motion given to the bolter, the vibration of the cradle is derived.

There is no claim made, nor does the specification accord with the allegations in the petition. The machine has nothing to do with the "digging and procuring gold from the mine," but is merely intended to wash it after it has been so procured.

The business of separating and washing gold from the ore, although new in the United States, is old, both in Europe and in the southern part of our own continent. When those engaged in the business here have acquired a knowledge of the different plans which have been, and are, pursued in those countries, they will have arrived at the starting post in the race of improvement; until then, the chances will be against those who procure patents under the claim of being inventors; and when they are not invalidated, their main pillar will be the same want of information on the part of others. As regards the cradle, or hollow segment, used in the present instance, it is claimed in a patent previously granted, but when or where invented, it would be difficult to tell, as a very similar contrivance has been long known and used.

---

29. For an improvement in the machine for *Cleaning Grain of every description*, called the "Fan Mill;" William C. Henley, Brookfield, Fairfield county, Connecticut, October 1.

(See specification.)

---

30. For a *Rotary Propelling Engine;* John G. Hotchkiss, Cincinnati, Hamilton county, Ohio, October 1.

This *propelling engine*, as it is called, is intended to operate as a pump, or fire engine. It is of the rotary kind, with sliding valves fitting into mortises in a revolving shaft, which is enclosed within an eccentric cylindrical box. In its general principle there is no novelty, and as there is no claim to any part, we think it altogether unnecessary to give a particular description of it. We intend to prepare an article embracing several similar plans, with remarks upon their theoretical advantages, and practical defects.

---

31. For a machine for *Washing the Wool on Sheep, or for washing it after it is shorn off, or for Washing Hats out of*

the Colour, also for the purpose of Washing Clothing; Charles Harris, Snow Hill, Clinton county, Ohio, October 1.

To wash sheep, a box capable of holding water is prepared; within this box two flutter, or dash wheels, are made to revolve: between these wheels the sheep is to stand, with his head out at an opening in the box, provided for that purpose. An open wire screen, or grating, on each side of the sheep, is to keep him from contact with the wheels. "The machine may be propelled by hand, by horse, steam, or water power." "The water is thrown by the motion of the wheels on the sheep with such velocity, that the wool will be immediately washed perfectly clean. In washing hats out of the colour, or clothing, a reel will be put between the grating, on which the article will be hung, that may require to be washed."

Thus endeth the specification, without any claim; but as we apprehend that this is the first machine of the kind used for this purpose, the whole may be considered as new.

---

32. For rendering *Paper Hats Water Proof;* Benjamin Grut, City of New York, October 1.

This seems to us to be a strange kind of patent, as it is merely for rendering paper hats water proof by varnishing them with spirit, or oil varnish, such as sandarach, mastic, and copal; or caoutchouc, dissolved in naptha. The hats, it is said, may be primed with gum, glue, size, or isinglass, and coloured with any kind of pigment.

If a patent for this process can be sustained, we know not any thing which may not be securely patented. Paper hats, varnished, are among our early recollections, almost half a century ago. But the hats then made are all worn out, and have passed away, whilst those which the present patentee makes, are new.

---

33. For a mode of *Combining the Power of the Lever and the Pulley, in the Standing Press;* George W. Grater, Boston, Massachusetts, and assigned to Lemuel Blake, of the same place, October 1.

(See specification.)

---

34. For a *Spiral Axle,* to be applied to clocks or time pieces generally; Abijah Gould, Henrietta, Monroe county, New York, October 1.

This is another patent in which nothing is claimed. It is really astonishing that a patent should now be taken for what has been known as long as wheels and pinions have been in use, or somewhere there about. The spiral axle is merely the endless screw, and we are told that it may be made "in the form of a common wood or iron screw, or in the form of a common cork screw," and that it is to match in the teeth or cogs of a wheel. If this be new, Solomon was mistaken, and we also have been mistaken in supposing him to have been a wise man.

35. For a *Perennial, or Self-supplying Fountain Pen*, for writing with ink; Marcus T. C. Gould, City of Philadelphia, October 1.

(See specification.)

---

36. For an improvement in the mode of *Separating Gold, and other Precious Metals, from the earthy substances with which they are combined;* Roswell King, M'Intosh county, Georgia, October 1.

A cylinder made of wood, or metal, four feet in diameter, and ten feet in height, is placed vertically, and has a piston and dasher, much like those of a common churn, and which is to be made to work up and down in the same manner, by any sufficient power. On the outside of this cylinder is placed a tube, which extends from the top of it to the bottom. This tube is for the purpose of conveying the earth to be washed, into the cylinder, below the dasher; it is, therefore, left open at its upper end, and at its lower, communicates with the inside of the cylinder. When water, and the earth to be washed, are put into the cylinder, the dasher is worked, the muddy water produced is to be let off from openings at different heights in the cylinder, and the gold, which, from its gravity, will settle to the bottom, is to be removed, either alone, or combined with quicksilver, and in mixture with the heavier materials.

The claim is to the mode of separating gold, by means of the above described machine.

---

37. For an improvement in the mode of *Separating Gold, and other Precious Metals, from the earths and stones with which they are often found combined*, called "Vibrating Cylindrical and Circular Troughs;" Roswell King, M'Intosh county, Georgia, October 1.

This machinery consists of a trough which is a longitudinal segment of a cylinder, of about 10 feet in length, and 3 in diameter, and of a circular trough, of about 5 feet in diameter, and 6 inches deep, with their appurtenances.

The cylindrical trough, or cradle, is made to incline a little towards one end, and it is separated into compartments, by several partitions, reaching across it, but, (we suppose,) leaving an open space between their lower edges and the trough. The earth to be washed is put, with water, into the upper division, and a vibratory motion is given to the trough; or the contents are agitated by means of a vibrating bar placed above the trough, from which dashers project down between each of the divisions. The earth is thus to be washed off, and the gold collected at the lower end of the trough. The circular vibrating trough is sometimes added to the cylindrical one, and is used to receive the materials which have been partially washed in the cylindrical trough; it then completes the operation. This trough is placed horizontally, with an iron axle in its centre; a vibra-

tory motion is to be given to it by means of a crank, and the waste matter runs off at a spout, or an opening in its rim. The invention claimed, is the before described mode of separating gold, &c. and the machinery by which it is accomplished.

We need not here repeat the observations made on No. 28, but think that they apply to each of the machines described.

---

38. For a *Machine for Mortising and Tenoning;* Elisha Mudge, Brookville, Genesee county, New York, October 1.

The mortising machine is intended, principally, for the hubs of wheels, but it may be used for other purposes. A stout frame is made, on the sills of which there is a sliding piece hollowed out to contain the hub to be mortised, and having attached to it screws for confining the hub in its place, and a graduated circular gauge, for laying off the mortises. At the upper part of the frame is a crank for working the mortise chisel, and another for turning an auger to bore a hole in the hub, to allow the chisel to begin its work. The tenons of the spokes are formed by a notched chisel, which cuts a shoulder on each side, and which is worked up and down by a lever.

There is not any particular part designated as the invention of the patentee, but he has taken the machine as a whole, and, as such, claims it as new in the following terms: "I have never seen, heard, or read, of a like invention. I think I may claim this as exclusively my own, without fear of contradiction."

---

39. For an improvement in the *Stock and Hand Vice;* Enoch D. M'Cord, Sandy Hill, Washington county, New York, October 1.

(See specification.)

---

40. For an improvement in the *Bar Share Plough;* Adam Mitchell, Jonesboro, Washington county, Tennessee, October 1.

In the description of this plough, we are informed of the curvature given to the mould board, and how it is braced, and attached to the beams; but it claims nothing. From an examination of the specification and drawing, we think that in this omission the patentee has done well; for had he claimed any particular part, its resemblance to other ploughs would have been rendered obvious, whilst under the present plan we are occupied in seeking for some latent novelty.

---

41. For an improvement in the mode of *Making the Single Twist Auger*, and the mould and machinery by which the same is made; Ezra L'Hommedieu, Saybrook, Middlesex county, Connecticut, October 1.

This patent is taken for a method of twisting the spiral of the patent single twist auger, now so generally used by ship builders,

and others. The patentee says, "the operation of making the twist by winding, and the mould and machinery applied for that purpose, are what I claim to have invented. The only mode of making this kind of auger, previous to my invention, being by swedging out the spiral turns with dies from a round piece, in the form of a bolt."

The drawing which accompanies the specification gives a very perfect view of the apparatus used, which will, undoubtedly, answer the purpose intended.

---

42. For *Manufacturing Soap, by means of Steam;* John Kennedy, Baltimore, Maryland, October 1.

The claim of the patentee will show, clearly, the object of the invention; it is in the following words.

"I do not claim as my invention the application of steam to the heating of liquids, or other materials contained in a wooden vat, or other vessel, this having been long known and used for various purposes; nor do I claim the foregoing modification of the apparatus for so doing, there being nothing new in the principle of its action; but what I claim is the application of steam to the manufacturing of soap, by conducting it into, or through, the vessels in which the materials are contained; this being, as I verily believe, originally discovered by me."

A patent for a similar purpose was granted to Messrs. Zell and Doyle, of Baltimore, on the 19th of July, as mentioned in our last number, p. 300. Mr. Kennedy, however, claims to have made the invention at a date prior to that of those gentlemen, and we believe that the respective claims of the parties are now the subject of litigation.

---

43. For an improvement in the *Distillation of Grain into Whiskey, of which Indian Corn is the principal ingredient;* Dan Samson, Perrysburgh, Cataraugus county, New York, October 1.

The patentee gives directions respecting the quantities of the different kinds of meal, and of water, that are to be mixed together; the degree of heat to be given to the mixture, and the time which should elapse in the different intervals; but after being very definite, he gives great latitude; which, as his patent is based upon these particulars, appears to render the whole unstable. We will give one example, as a specimen of the whole. "Then stir the mash well, and cover the tub, and let it stand one hour; the time, however, may be varied from $\frac{3}{4}$ to 3 hours." After this he claims "the quantity and heat of water mentioned." "The length of time the mash stands from the time the corn meal is put in, before the rye meal and malt are put in. The length of time the beer stands before running. The small quantity of English grain to the corn," &c. &c.

[TO BE CONTINUED.]

Specifications of American Patents.

Specification of a patent for a new mode of combining the power of the Lever and the Pulley, in the Standing Press. Granted to George W. Grater, *of Boston, Massachusetts, October* 1, 1830, *and assigned by him to* Lemuel Blake, *of the same place.*

To all whom it may concern, be it known, that I, George W. Grater, of Boston, in the state of Massachusetts, have invented a new mode of combining the powers of the lever and the pulley, in the standing press, for pressing articles of various kinds; which press is intended to be used as a substitute for the ordinary lever, screw, and hydrostatic presses; and that the following is a full and exact description of the same.

I make a strong frame, which may consist of cheeks, properly united by cross pieces, with mortises and bolts, in the manner common in screw presses; or, instead of cheeks, I use four strong corner posts, mortised into sills, and having such cap and cross pieces, or ties, framed into them, as may be deemed necessary. This latter mode I prefer, and it is the one which is represented in the drawing deposited in the patent office. The bed of the press I usually place near the upper part of the frame, or cheeks, bolting, and otherwise securing it firmly thereto; the follower being suspended below, by the tackle, in the manner to be presently described.

Across the top of the frame, or cheeks, and extending from side to side, I affix a strong iron axle, turning upon gudgeons, in suitable boxes; upon this axle, and usually near its middle, I place an iron toothed wheel, and on each side of this wheel, cylindrical pieces of wood, or other material, around which the rope to be used is to wind in the operation of the press. A second axle is placed parallel to the former, having upon it a pinion or small toothed wheel, which takes into the former; there is also fixed upon this axle, a round block, or hub, with mortise holes, to receive the end of the lever, or hand spike, which is to operate upon this compound windlass. Ratchets and palls are employed in the usual manner. At each end of the bed, and of the follower, and attached thereto, I place two, three, or more sheeves, or pulleys; the ends being notched out to receive them, and a bolt upon which they are to turn, passing through, or on one side of the bed and follower. For the purpose of obtaining the greatest strength, it will be best to secure these bolts, by staples, on the upper side of the bed, and on the lower side of the follower, instead of passing them through their substance.

The press, as before described, is now ready for the reeving of the rope, which is thus effected. A single rope is taken and passed under the follower towards the back part thereof, the two ends being brought up through openings left in the ends of the follower for that purpose; they are then passed over the two back pulleys of the bed, and under the two of the follower, and successively around the re-

maining pulleys, until they pass up from the last pulley on the front of the follower; the two ends are now secured, one on each of the cylindrical pieces of the first named axis, when the press is ready for use. In order to preserve an equal tension in the rope, that part of it which passes under the bed is sustained by friction rollers.

The operation of the press is now manifest, as it is similar in principle to that of an ordinary tackle, operated upon by a windlass.

In order to sustain any part of the articles in press at any required height, holes are bored through the cheeks, or uprights, into which rods, or pins, may be inserted, so that any part may be taken out and renewed without taking out the whole.

If it be thought best to have the bed below, and the follower above, this may be effected by reversing the whole arrangement; but in this case the weight of the follower and of its appendages, must be counterpoised, by extending a rope from each end of it, passing over a pulley above, and so loaded as to sustain it in its place.

Presses operated on by means of a windlass and tackle, have been heretofore made, but they have been inconvenient in use, in consequence of the arrangement of the parts. I do not, therefore, claim a lever and tackle press, generally, but what I claim as constituting my invention, is the manner in which the rope is reeved over the pulleys attached to the bed and follower, as described in the foregoing specification.

It will be obvious that where continued pressure is required, a weight may be allowed to remain suspended upon the end of the lever, which added to the elasticity of the ropes, will produce a powerful continued effect. It may likewise be observed that chains may, in certain cases, be substituted for the rope.

GEORGE W. GRATER.

Specification of a patent for a machine for Flattening Cylinder Window Glass. Granted to WILLIAM COFFAN, Jr. *Hammonton, Gloucester county, New Jersey, October* 1.

BE it known, that I, William Coffan, jr. have invented a new and useful improvement in the machine for flattening cylinder window glass, and that the following is a full and exact description of the construction and operation of the said machine as invented by me. The present mode of flattening glass, is, by having two stationary stones, one in the flattening oven, on which the glass is flattened out from the cylinder form, and then is passed, by sliding over the surface of this stone, on the other stationary stone, which is in the annealing, or cooling oven, through a small crevice under the partition wall which separates the two ovens, about half an inch above the surface of the two stones, which are joined together underneath this partition wall, and then the glass is raised up from the stone in the cooling oven, after sufficiently cooled, and stacked away.

What I claim as new, and as my own invention or discovery, is an improvement made in the above described machinery, and for the use

of which I ask an exclusive privilege. This consists in having a circular table, or wheel, with the stones for flattening and cooling placed upon both sides, on the top, or to cover the whole surface; and to carry the glass upon it when flattened, by revolving horizontally upon its centre, to the cooling, or annealing oven; to be supported and worked by proper machinery for that purpose, instead of having the two stones permanently fixed, one in each oven, and the glass shoved, or pushed, over the surface of the stones from the one in the flattening oven, to the other in the cooling oven.

The centre of this horizontal wheel, or table, is to be under the partition wall which divides the two ovens, at a distance above the top of the wheel, or table, sufficient to pass the glass under, so that the glass placed upon, and flattened on the stone, on the half of the wheel, or table, in the flattening oven, may be carried around upon this table which revolves on its centre, under the said wall, to the cooling oven, without taking it from the stone until it arrives in the cooling oven, and then, when sufficiently cool, to be placed away; at the time the wheel, or table, is stopped revolving, and the glass upon it is cooling and taken off in the cooling oven, after having been conveyed upon it, from the flattening oven, another cylinder can be flattened on the stone on the other half of the wheel, or table, that has passed by its revolution from the cooling to the flattening oven.

By this operation it does not require that the glass should be removed from the stone upon which it is flattened, which preserves the polish, and prevents the surface of the glass from being scratched, which is the case when it is pushed over the surface of the stones, from the one to the other. It also differs from the other mode, in this, that by the revolving of this wheel, or table, the stones are both made flattening, and both cooling stones, or the whole wheel, or table, is both a flattening and cooling stone. WILLIAM COFFAN, Jr.

Specification of a patent for a Rail-road Car. Granted to JOHN ELGAR, *of Baltimore, Maryland, October* 1, 1830.

To obtain a form and combination of substances that will reduce the friction in the rubbing parts of a rail-way car, to its lowest point, where the "friction wheels" are not used, I adopt the admirable plan of outside journals, introduced and patented by R. Winans. The essential advantage of which, is, that the journals are reduced one-third in diameter (of course the friction is equally reduced) still preserving the full size and strength of the axles between the wheels. The axles extend through the wheels, about 4½ inches, are steeled, and turned to 2 inches diameter, and hardened, which forms the journal. To this journal I adapt a bearing, or box of cast iron, either in two pieces, or one entire piece; and to obtain an opening in the box that shall at once combine a proper shape to fit the journal, with a smooth and excessively hard surface, it is cast upon a "chill," or piece of iron dressed to the size of the journal, but with three ribs upon it, running lengthwise, which divides the circular

opening of the box into three parts, and reduces the bearing on the journal to one-fourth of its circumference. In the contact of substances so hard, this quantity of surface is sufficient, and the friction is less.

The back part of the box is at the same time *chilled*, for the purpose of receiving against it the steel centre point of the journal, that the tendency to lateral motion may be governed, without the friction consequent upon shoulders. To exclude dust, and confine the oil, I use a packing plate, similar to that which is used at the piston stem of the steam engine. This plate passes on the journal in front of the box, and is screwed up to the latter, with packing of hemp, leather, or cork.

The side, or face of the plate toward the wheel, has a projecting flanch upon it, which embraces the hub and excludes the dirt.

The box will perhaps contain one half gill of oil beside the journal, which insures a perfect lubrication of the latter.

The improvement that I claim as my invention, is the chilled, cast iron box, combined with the *steeled*, centre pointed journal; the peculiar form of the inside of the box, which reduces the surface of the bearing, and the packing plate. JOHN ELGAR.

Specification of a patent for an improvement in the construction and application of Friction Rollers. Granted to DAVID BALDWIN, *of Queensbury, in the county of Warren, and state of New York, October* 1, 1830.

THE friction rollers which have hitherto been applied to the gudgeons of heavy wheels, or to the axles of carriages, have generally been constructed as follows. A number of cylindrical rollers of cast iron or brass, are connected to a flat ring at each end, by an arbour passing through each roller being rivetted to these rings. The rollers are then fitted to a hollow cylindrical metallic box, the inside of which is smoothly finished, so that the rollers may roll freely around its internal surface: a cap is then fitted to each end to keep the rollers in their place; perforations being left sufficiently large to permit the rings to which the rollers are rivetted to revolve freely within them. This box of rollers is then put upon the axle, or gudgeon for which it is intended. The objection to using rollers thus constructed, is, that it is difficult to tighten them when worn; which will soon happen if used in heavy work. To obviate this difficulty is one of the principal objects of the present improvement.

My improved rollers are constructed in the following manner. The middle portion of each roller is cylindrical, but the two ends are in the form of the lower fructrum of a cone, with the bases applied to the cylindrical portion, and of the same diameter. The rollers are connected to each other by a ring at each end in the common method. The box in which they run is shaped on the inside to correspond with the shape of the rollers. The straight, or cylindrical part of them, however, is not permitted to touch the inside surface

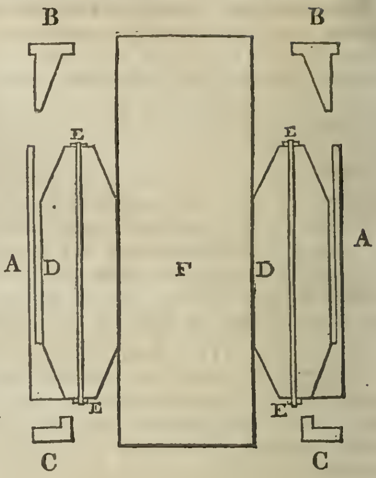
of the box, a slight enlargement being made therein for that purpose. The rollers then touch the box only on the slant side of their conical ends, and it will readily be perceived that if they wear, they can be tightened, if the upper and lower parts of the box can be brought nearer together, and that this may be done, I construct the box in the following manner. In the first place, let the box be made a perfect hollow cylinder, as in the old method, a little larger than is necessary to receive the rollers which must be placed within it. There will then be a space between the tapering ends of the rollers and the inside of the box, which must be filled up. Let a casting be made to fill this cavity, and fitted so that it may be put in and taken out at pleasure; and from around the upward portion of this casting, let a circular flanch project outwards, so that its outward edge may correspond with the outside of the cylinder, and its bottom may be brought in contact with the cylinder's upper surface. (The terms upper and lower are here employed with reference to the position of the box when used for a grist mill spindle, or any other perpendicular shaft.) Let two screws pass through this flanch into the cylindrical box, which is tapped for their reception opposite each other; that is, one screw on each end of a diameter of the cylinder. Let another diameter be drawn at right angles with the first, and at each end place another screw, the female part of which is within the flanch, and its blunt end pressing upon the edge of the box. The first mentioned screws will draw the two nearer together, and the others will separate them, so that by these screws they may be made loose, or tight, at pleasure. Connected with this flanch, and in the same place, another flanch projects inwards as far as may be, without interfering with the rings to which the rollers are fastened, the object of which is merely to keep the rollers steady. Both ends of the box may be fitted in the manner above described; or the lower portion of the box may be made to fit the taper of the rollers. A flat ring screwed to the bottom as above described, with an elevation from its lower surface for the rollers to rest upon, will serve to raise or lower them, as may be required. The rollers and boxes may be made of any metal sufficiently hard, whether cast or wrought, but for heavy work, I prefer cast iron.

Another improvement which I believe to be new and useful, is the application of friction rollers to the spindles of grist mills. It is well known that it is somewhat difficult to bush a spindle properly. If made too loose, it will not run steadily; if too tight, it will soon heat. My method of applying the rollers to the spindle, is simply to fit them accurately to it, and to wedge the box which contains them, into the eye of the lower stone. The grain is kept from falling into the box by a leather collar fitted to the spindle, as has been formerly practiced.

What I claim is the making of a portion of each end of the rollers tapering, that they may be tightened, as above described; and the application of friction rollers to the spindles of grist mills.

DAVID BALDWIN.

Description of the Section.



A, A, section of the hollow cylindrical box to receive the rollers.

B, B, a short cylinder, the outside of which will fit the inside of the box A, and the inside just receive the tapering ends of the rollers.

C, C, the bottom of the box A, A, attached by screws in the same manner with the upper portions B, B.

D, D, sections of two of the rollers, the gudgeons of which are rivetted to the rings at E, E, E, E.

F, a spindle within the rollers.

Specification of a patent for an improvement in the machine for cleaning wheat of every description, commonly called the Wheat Fan. Granted to WILLIAM C. HAWLEY, *Brookfield, Fairfield county, Connecticut, October* 1, 1830.

BE it known, that my improvement in the wheat fan is as follows. Beneath the hopper into which the grain, or other seeds, are put, for the purpose of being operated upon by the machine, is placed a revolving cloth, or apron; the *cloth* (so called) may be made of leather, canvass, or other suitable material; and, of itself, forms the bottom of said hopper, upon which the seeds, or grain, may rest. Upon one of the rollers around which the cloth passes, and upon the end of said roller, is fixed a pulley, or band wheel, of eighteen inches diameter, more or less. Upon the end of the same roller is fixed the crank by which the machine is put in motion. A pulley is also fixed upon one end of the fan wheel's shaft, of six inches diameter, more or less, from which a band passes to, and around the eighteen inch pulley before mentioned.

Thus, by turning the crank, the fan wheel is put in motion, and also the revolving cloth by which the seed, or grain, is drawn from the hopper and precipitated upon the seives, or riddle; the machine being made like most fan mills now in use, with the exception of the revolving cloth, &c. as above specified.

That which I claim as my invention and improvement, is, the application of the revolving cloth as above specified, for the within mentioned purposes. WILLIAM C. HAWLEY.

Specification of a patent for a Perennial Fountain Pen. Granted to MARCUS T. C. GOULD, *Stenographer, of the City of Philadelphia, October* 1, 1830.

BE it known, that I, Marcus T. C. Gould, of the city and county of Philadelphia, and state of Pennsylvania, have made a new and useful improvement in a pen for writing with ink, called the Perennial, or Self-supplying Fountain Pen; and that the following is a full and exact description of its parts, construction and use, viz.

1st. A cylindrical barrel, of gold, silver, glass, or other material, about five inches in length, and one-third of an inch in diameter, to be filled with ink.

2nd. A shaft of metal or other substance, screwed into the lower end of the barrel, and projecting downward, below it, about half an inch, and forming in its diminished size, a collet, upon which is slid a common, or metallic pen.

3d. A small tube, or conductor, of gold, silver, or other material, passing upward through the collet, and communicating with the column of ink, by means of a regulator, hereafter described; and at the same time extending downwards, along the centre of the pen, with the lower end so bent as to open directly upon the split of the pen.

4th. A hollow wire, or rod, called the regulator, passing through the upper end of the barrel, and extending downwards through the barrel and shaft till it meets the ink tube, about midway of the shaft and collet. This regulator has a small groove, or other opening, near each end (and within the fastening or packing box, at each end of the barrel) for the purpose of admitting, when unscrewed, ink below and air above—that is, ink into the tube and air into the barrel; and at the same time opening an uninterrupted channel through the whole length of the instrument; through which, if the regulator be screwed down, and opened above, air, or water, may be forced for the purpose of cleansing the tube, and that, without communicating with the ink in the barrel.

5th. A piece of sponge, or other porous substance, attached to the wire immediately above the shaft, and filling the entire diameter of the barrel, about $\frac{1}{4}$ of an inch upward, thus forming, when the regulator is unscrewed and the pen in use, a strainer of the ink, and a regulator of its flowing; or, when screwed down, and the pen at rest, a general valve upon which the whole column of ink may rest. Immediately above this spongy substance, is attached to the rod, a thin, flat circular plate, or follower, equal in width to the inner diameter of the barrel; this plate should be finely perforated in various places near its circumference.

6th. A small stopper, at the upper end of the regulator, and a suitable cap at each end of the barrel, to give a finish to the whole, completes the instrument.

Remarks upon the construction and use.

The regulator should be so adjusted as to open or close the air vent and ink valve, simultaneously; and, if preferred, the object may be effected by a pressure of the finger, or thumb, when writing, upon a spring near the lower end of the barrel, instead of turning a screw, or regulator, at the top, as above described.

The ink tube should not perfectly coincide with the axis of the collet, but incline a little towards the circumference at the lower end, so that by turning the pen and conductor, (or ink tube,) a greater or less pressure may be produced between the two, at their junction.

The collet should be of sufficient length to allow of sliding the pen, so as to bring the nib nearer to, or farther from, the mouth of the tube, when it shall be desirable to make the ink flow faster or slower.

If these several points be attended to, the instrument will be regulated in four separate and distinct methods; and when charged, will supply itself for hours together, as fast as may be desired by the writer, whether writing slowly or rapidly; for the opening and closing of the split of the pen, when in use, will cause the ink to flow in exact proportion to the number of motions produced; and when the pen ceases to move, the ink will cease to flow.

The improvements claimed are these, viz.

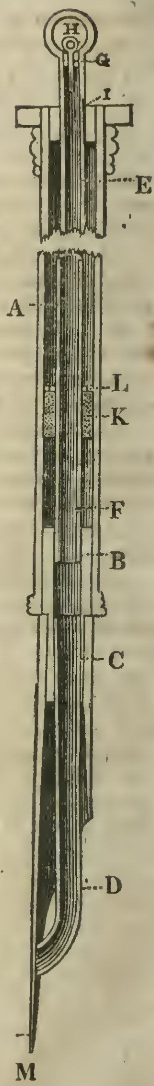
1st. Conducting ink from a reservoir, or fountain, directly to the split of the pen, through a tube opening upon the concave surface of the pen.

2nd. Straining the ink from impurities, and regulating its flowing by a spongy or porous substance within and at the bottom of the barrel.

3d. The method of opening and closing the ink tube and air vent.

4th. The provision for clearing the ink tube, when clogged.

MARCUS T. C. GOULD.



References to the drawing of the section of the pen.

A, cylinder barrel. B, shaft. C, collet. D, small tube or conductor. E, regulator. F, opening to admit ink to the regulator. G, opening for air. H, stopper to the opening. I, Groove to admit air to the barrel. K, piece of sponge. L, follower. M, nib of the pen.

Specification of a patent for an improvement in the manufacture of Wheels, Pinions, or Movements, to be employed in the construction of Clocks, Time-pieces, or other machinery. Granted to John P. Bakewell, *Pittsburgh, Alleghany county, Pennsylvania, October* 1, 1830.

The said improvement consists in making the said, wheels, pinions, or movements, of glass, instead of the substances or materials which have been heretofore employed for that purpose. Which object may be obtained by forcibly compressing a proper quantity of melted glass between moulds or dies, in which an indentation, or cavity, has been made of the form and size which is intended to be given to the wheel, pinion, or movement, in such a manner that the said wheels, pinions, or movements, shall be formed with the requisite number of teeth, cogs, or leaves, and shall require little, if any dressing off, to fit them for use.

The holes by means of which the arbors, or axles, and the various springs, pins, &c. are intended to be attached to the said wheels, pinions, or movements, may either be made by corresponding cores, or piercers, of the required shape and size, placed within the moulds or dies, or they may be drilled through the said wheels, pinions, or movements, after the glass is cold.

It is to be observed, that in some cases it may be more economical and convenient to make the wheel and pinion in one piece, with a hole through the centre for the arbor or axis, which may be done by constructing the moulds, or dies, accordingly. And that the said, wheels, pinions, or movements, may either be used alone, or combined with others made of any of the materials heretofore employed for that purpose.

As no claim is made to any particular construction of moulds, or dies, it is considered unnecessary to describe them minutely; but any person who has been accustomed to construct the moulds or dies which are used for the purpose of making glass plates, &c. by pressure, can readily construct such as would answer for making glass wheels, pinions, or movements. And as the relative size of the wheels, pinions, or movements, and the number of teeth, cogs, or wheels in each, must depend upon the judgment of the clockmaker or machinist, no specific size can be designated, and the claim is therefore for making wheels and pinions, or movements of glass, of any size, and with any number of teeth, cogs, or leaves, and applying the same to the construction of clocks, time-pieces, or other machinery, either alone, or combined with others made of any of the materials which have been heretofore employed for that purpose.

John P. Bakewell.

Specification of a patent for an improvement in the method of Saccharifying Rye, and other kinds of Grain; the Sweet, and common Potato, and other Vegetable Substances containing Fecula. Granted to Amable J. Brasier, *of the city of Philadelphia, Oct.* 1, 1830.

Into any convenient vessel, (which, however, must be made of materials on which diluted sulphuric acid cannot act injuriously,) I put one hundred parts of either of the above named substances, with from one to three hundred parts of water, acidulated with from two to four parts of sulphuric acid, I then bring the whole to the boiling point, which heat I maintain during the whole time of the operation. The heated water first converts the fecula contained in the substance employed into a mucilage, which is afterwards liquefied by the action of the acid, which, by keeping the liquid in a state of fluidity favours the saccharification.

When the substance employed is finely divided, the heated water acting upon the whole of the fecula at once, the quantity of mucilage formed, thickens the mass very much; I, therefore, when I use but little water, do not add the whole of the substance, but keep a part to add in portions when the mass is liquefied. I also usually agitate the mass to facilitate the liquefaction.

When the substance is not finely divided, the action of the heated water on the fecula being slower, the mucilage is partly liquefied as soon as formed, the mass not being thickened as in the first case, I add the whole of the substance at first; I also agitate it, but it is to divide, or the better to crush it, as the action of the heat and acidulated water soften it.

I regulate the quantity of water to be used according to the state of concentration in which I wish to obtain the sirop, and if the heating is effected by introducing steam into the mass, a quantity of water equal to that formed by its condensation should be deducted from the original quantity.

The time required for the operation varies very much, as it depends upon the nature and state of the substances acted upon; the more compact and coarse it is, and the more sparingly the acid is used, the longer period will be required; even more than four days; while, on the contrary, it may be completed in less than six hours, if the acid is used profusely, and the substance acted upon is porous or subdivided; I only give the above as a guide, for I always ascertain its termination by the tincture of iodine no longer giving a blue or purple colour to the liquid, as is the case so long as any portion of the fecula remains unsaccharified.

I then neutralize the acid with lime, or a carbonate of lime, and separate, if required, by filtering, or any other means, the sirop from the sediment.

The sirop thus obtained may be afterwards evaporated, fermented, or applied in any way which may be found convenient.

Since I have made the above improvement, I have ascertained that the common potato had already been used for the above pur-

pose, but it was first reduced to a pulp, and afterwards so treated as to require considerable labour; but I have discovered that the saccharification of the potato can be effected by exposing it whole to the combined action of heat, and of acidulated water. So far as the common potato is concerned, therefore, I limit my claim to saccharifying it without first reducing it to a pulp.

What I further claim as new, and as my invention and discovery, is the saccharification, by the combined action of heat, and water acidulated by sulphuric acid, of the fecula of the substances already referred to, without separating it from their other principles, by whatever variation of the within recited process the same may be effected.

A. J. Brasier.

Specification of a patent for an improvement in the mode of Saccharifying Rice and Maize, (Indian Corn.) Granted to Amable J. Brasier, *of the City of Philadelphia, October* 1, 1830.

Into any convenient vessel, (which must, however, be made of materials on which diluted sulphuric acid cannot act injuriously,) I put one hundred parts of rice, or of maize, either in their natural states, or in that of flour, or meal, with from one to three hundred parts of water acidulated with from two to four parts of sulphuric acid. I then bring the whole to the boiling point, which heat I maintain during the whole time of the operation; the heated water first converts the fecula contained in the substance employed into a mucilage, which is afterwards liquefied by the action of the acid, which, by keeping the liquid in a state of fluidity, favours the saccharification.

When the substance employed is finely divided, the heated water acting upon the whole of the fecula at once, the quantity of mucilage formed, thickens the mass very much; I, therefore, when I use but little water, do not add the whole of the substance at first, but keep a part to add, in portions, when the mass is liquefied; I also usually agitate the mass to facilitate its liquefaction.

When the substance is not finely divided, the action of the heated water on the fecula being slower, the mucilage is partly liquefied as soon as formed, the mass not being thickened as in the first case, I add the whole of the substance at first; I also agitate it, but it is to divide, or the better to crush it; as the action of the heat and acidulated water soften it.

I regulate the quantity of water to be used according to the state of concentration in which I wish to obtain the sirop, and, if the heating is effected by introducing steam into the mass, an equal quantity of water to that formed by its condensation should be deducted from the original quantity.

When the largest proportion of acid is used, corn, unbroken, is saccharified in about twenty-four hours, and its meal in about six. Rice, either whole, or in a state of flour, is also saccharified in about six hours. When, on the contrary, the smallest proportion of acid is used, it may require more than four days for corn unbroken, and

thirty-six hours for its meal. Twenty-four hours for rice, but, for its flour, about one-fourth of that time is sufficient. As the time given above may vary, I merely give it as a guide, for I always ascertain the termination of the operation, by the tincture of iodine no longer giving a blue or purple colour to the liquid, as is the case so long as any portion of the fecula remains unsaccharified.

I then neutralize the acid with lime, or a carbonate of lime, and separate, (if required,) by filtering, or any other means, the sirop from the sediment.

The sirop thus obtained may be afterwards evaporated, fermented, or applied in any way which may be found convenient.

What I claim as new, and as my invention and discovery, is the saccharification, by the combined action of heat, and water acidulated by sulphuric acid, of the fecula of rice and maize, without separating it from their other principles, by whatever variation of the within recited process the same may be effected.

A. J. BRASIER.

Specification of a patent for an improvement upon the Running Cap Spinner, which was patented on the 13*th of June*, 1829. *Granted to* JOHN THORP, *Providence, Rhode Island, November* 11, 1830.

(WITH A COPPER-PLATE.)

BE it known, that I, John Thorp, of Providence, in the county of Providence, and state of Rhode Island, &c. have invented, constructed, made, and applied to use, new and useful improvements in machinery for spinning, and in spinning cotton yarns, being improvements on my running cap spinner, patented on the 13th day of June, A. D. 1829, by which is produced a new mode of obstructing the revolving progress of the yarn, causing it to fall back of the cap, and wind upon the bobbin.

The spindle used is the common throstle spindle. Two projecting lips are affixed to that part of it where the bobbin usually traverses.

These lips are on opposite sides of the spindle, are parallel with it, and project about the sixteenth of an inch. They extend up no further than the base of the bobbin, when at its highest position, and there should be length enough to the spindle above them, to allow the bobbin to be raised above them, so as to turn on the spindle for the purpose of yielding the yarn for piecing, &c.

The common throstle flyer is converted into what I call a cap, by affixing to the lower extremity of its arms, in a horizontal position, a ring called the connecting ring, sufficiently large to allow the bobbin to traverse up and down through it. This ring guides the yarn to, and distributes it on, the bobbin. The yarn is not connected with the cap, but is left to revolve around its surface.

The bobbin used, is the common throstle bobbin, with a channel, or groove, formed on each side of its perforation, in which the above

described lips of the spindle traverse, and by which the bobbin is made to turn with the spindle. Or, there may be to each spindle, a tube of the length of the bobbin, in which the said channels, or grooves, may be formed, having a large head, or collar, at the bottom, on which the bobbin will loosely set. This tube may be made of sheet iron, and not entirely closed, and brazed to a head, or collar, of the same. In this case, the opening in the side of the tube, will answer for one channel, or groove, and the other channel, or groove, and one of the lips on the spindle may be dispensed with. The friction of the base of the bobbin on this head, or collar, will be sufficient to give motion to the bobbin; and the bobbin being allowed to turn on said tube, will at any time yield the yarn when it is necessary that it should be drawn from it, as in piecing the ends, &c. Or, instead of said lips, on the spindle, grooves, or channels, may be made in it, and a collar used to give motion to the bobbin. This collar should be about the size of the base of the bobbin, and made to slide loosely on the spindle. From the sides of its perforation, two lips project inward, and into the channels, or grooves, in the spindle, causing the collar to turn with the spindle.

But the principal improvement consists in a stationary spiral lip, or rim, that I call the check. The upper edge of the check is within the connecting ring. One end, or part of this check, is placed and remains above this ring, while the other end remains below it. The space between the inside of this ring and the outside of the check, should be large enough to allow the yarn to revolve freely in it.

The friction, or tension, requisite to wind the yarn upon the bobbin, is produced by the upper edge of the check over which the yarn is drawn, or compelled to pass at every turn of the spindle. The check is a thin piece of metal, bent flatwise, forming a curve corresponding with a circle less in diameter than that of the ring. It is fastened to a knee that is bolted, or otherwise fastened, to a fixed bar, or rail, that stretches along the spinning frame, back of the spindle. By means of a slot, or mortise, in said knee, the check can be raised or lowered at pleasure, carrying its upper edge more or less above the bottom of the connecting ring, and producing more or less angle in the yarn; consequently, increasing or diminishing the friction, or tension of the yarn, and winding it more or less tight on the bobbin. Said check should extend half way round the bobbin, though a greater or less proportion may answer the purpose.

Small polished notches, or protuberances, on the upper edge of the check, will produce an increased tension on the yarn. The yarn passes down on the outside of the connecting ring, or lower edge of the cap, then up between said ring and the check, and over the upper edge of the check to the bobbin.

Among the several improvements above described, there is but one in which I claim an exclusive property, and that is, the check, as above described, by which the progress of the revolving yarn is obstructed, the yarn made to fall back of the cap, and to wind on the bobbin.

JOHN THORP.

References to the Plate of J. Thorp's improved Running Cap Spinner.

A, the spindle.
B, the cap.
C, the connecting ring.
D, the box that forms the upper bearing of the spindle.
E, the step in which the spindle stands.
F, the bobbin.
G, the head or collar on which the bobbin stands.
H, the tube on which the bobbin loosely turns.
I, I, the check, that obstructs the revolving progress of the yarn, causing it to fall back of the cap, and wind on upon the bobbin.
J, J, two lips on the spindle, formed by soldering two pieces of wire to it. They slide in the two channels formed in the bobbin or tube, causing the bobbin to turn with the spindle.
K, the whirl.
L, a collar that slides loosely on the spindle. From its perforation two lips project inward, and into the channels in the spindle, by which the collar is made to turn with the spindle. The bobbin sets on this collar, and the friction of its base on the collar gives motion to the bobbin. This collar, as well as the head or collar of the tube, H, sets on the vibrating rail or lifter of the common throstle frame, and moves with it to distribute the yarn on the bobbin.
M, M, one of the channels or grooves in the spindle. The other is directly opposite to it.

In altering spinning frames now in use, or those where the spindles are small, it would be better to use the lips, rather than the channels, as the latter would weaken them.

In building new spinning frames, the spindles can be made enough larger for that purpose. They both work equally well. The yarn is represented as passing through the loop above the spindle.

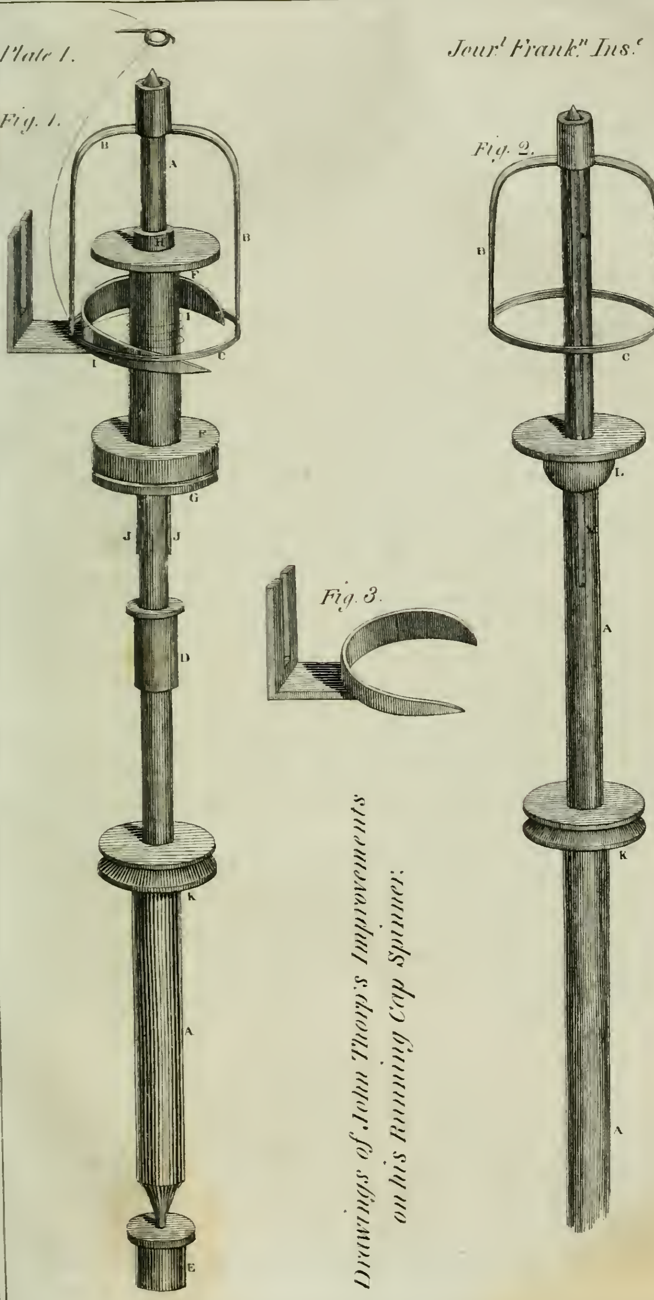
Fig. 3, represents the check. This will answer a good purpose in making cotton roving, &c.

Specification of a patent for an improvement in the Stock and Hand Vice. Granted to Enoch D. M'Cord, *of the Village of Sandy Hill, in the county of Washington, New York, October* 1, 1830.

In the vices which have been heretofore in common use, the washer between the head of the screw and the front stock, and that portion of the pipe box which comes in contact with the back stock, have merely plane surfaces, at right angles with the axis of the screw, which press upon corresponding surfaces upon the two stocks. When the vice is closed, they are in perfect contact; when it is open they are not. When a common blacksmith's vice is opened four or five inches, no part of the washer touches the stock, but its upper edge; when, therefore, an attempt is made to secure any large body in it, it cannot be held as firmly as a small one, and the screw is in dan-

Plate 1.

Jour.l Frank.n Ins.e V. 6



Drawings of John Thorp's Improvements on his Running Cap Spinner.

ger of being broken. To obviate this difficulty is one of the principal objects of the present improvement.

To effect this, the washer to be used under the head of the screw, and the front end of the pipe box, I make in the form of a segment of a globe, perforated in the centre for the reception of the screw; a cavity to correspond is made in the outside of each stock, at the place through which the screw passes, and fitted so as accurately to receive one of these spherical segments, and thus form a segment of the ordinary ball and socket joint, which will adapt itself to any position of the jaws of the vice. They may then be pressed together with equal firmness, whether a large or a small body is between them, and the screw is not more liable to be broken in one case than in the other. As the stocks of vices in general have no lateral movement, it is apparent that a joint to answer all the purposes desired may be constructed in the form of any regular solid of revolution, or any segment thereof, made parallel to its axis, or coinciding with it; but a spherical segment not exceeding half a sphere, I prefer to any other shape, as the cavities can all be fitted with drills, and less of the substance of the stock will be removed in fitting. It is equally obvious that in constructing this joint, it is not material to have its concave portion upon the stock of the vice, as the principle and operation will be the same if the order be inverted, that is, the washer and pipe made concave, and the stocks convex.

As it is my intention to make most of these vices of cast iron; I have made another improvement, which is, however, equally applicable to cast iron or wrought. It consists in making the face of the jaws of other and harder materials. A plate of steel with suitable teeth cut in it, is screwed to the inside of each jaw, the bottom resting on a shoulder in the stock; or the same plate may be made to constitute the inner portion of a band, driven around the upper end of each stock. When it is wished to avoid the expense of steel jaws in the manufacturing of cast iron vices, the jaws may be chill hardened when they are cast.

What I claim, is the giving such a form to the washers, or to the bearings of the screw and pipe against the stocks of the vice, as shall enable them to adapt themselves thereto, whether the vice be opened or closed; the same being effected on the principles herein described. I also claim the application of steel to form the jaws of cast iron vices, whether the steel be secured to the iron by screws, rivets, bands, or otherwise.

ENOCH D. M'CORD.

ENGLISH PATENTS.

To JOHN YATES, *Calico Printer, for a method or process of giving a metallic surface to Cotton, Silk, Linen, and other fabrics.* Dated January 26, 1830.

I, THE said John Yates, do hereby declare, that my said invention consists in applying a metallic surface to cotton, linen, silk, and

other fabrics, by reducing the metal or metals employed to a state of powder, afterwards mixing that powder with some farinaceous paste or other mucilaginous or cohesive substance, such as glue or gum, to cause it to adhere to the cloth or fabric to which it is to be applied, and by subjecting the cloth, to which the powder has been applied, to a high degree of friction, in order to produce the bright or burnished appearance of metal, at much less expense than has been hitherto effected. And in further compliance with the said proviso, I, the said John Yates, do hereby declare, that the manner in which my said invention is to be performed, is set forth in the following description, (that is to say:—)

The metal I commonly use, is tin, as combining cheapness with brilliancy, and I dissolve it by means of a sand bath, in pure muriatic acid, of the specific gravity of 1.160, or thereabouts, until the quantity of acid used is saturated with the tin, which is always known when any portion of the latter continues in the vessel undissolved by the acid. This solution, so prepared and ready for use, I keep carefully made up in bottles, to prevent its absorbing oxygen; I then employ a vessel of wood, about five feet long, three feet wide, and one foot deep, along which I place, lengthwise, an iron centre, which runs on its own axis, and having supporters, on which centre I frame a cylinder of hoops of zinc or spelter, running the whole length of the vessel, each hoop being fourteen to twenty inches in diameter, about five or six inches wide, and one or two thick; the cylinder is so placed as to run about half an inch deep in the liquor used: I then fill the vessel with pure cold water, and the solution of tin before mentioned, in the proportion of one part of the solution to ten parts of water, and the cylinder is made to revolve slowly by the application of any moving power, so as continually to present a fresh surface to the liquor in the vessel. This process is continued, the tin appearing reformed or revived on the whole surface of the cylinder, by the combination of the zinc of the cylinder with the oxygen of the tin previously dissolved in the liquor, and consequent precipitation or revival of the tin, according to a principle well known and acted upon in chemical manufactories. The tin so reformed or revived is carefully scraped off by a wooden or metallic instrument, into another vessel, in which it is washed with clear water, in order to deprive it of every impurity, the water being changed or renewed until it becomes tasteless.

The metal, after being subjected to this washing, is taken out, and ground between two flat pieces of wood until it will pass through a fine brass wire sieve; it is then boiled several hours in water, and is afterwards put upon flakes or filtres of cloth in a stove to dry; when dry, it is again passed through a fine brass sieves, and again boiled in water, for about four hours; after it has undergone the second boiling, I add to the water, in which the metal continued after the second boiling, a little diluted muriatic acid, in order to take away any oxidation of the metal, which might have occurred during the operations above described, or any remaining impurity. It is then again washed in cold water, until the water becomes

tasteless, and being then taken out, dried as before, and again passed through a fine brass wire sieve, it is fit for use in the next stage of my process.

In order to apply the powder to cover the whole surface on one side of any fabric of cloth composed of cotton, linen, or silk, either separately or combined, I proceed as follows: my cloth being scoured, cleaned, bleached, or dyed, as may be required, I pass it through a friction or common calender, to give the fabric a firm and smooth face. I then, by means of a machine, or block, or brush, any of which may be used for this purpose, lay on a uniform covering of starch or paste, of sufficient consistency to work easily; the starch which I use for the purpose, being made by dissolving about one pound and a half of starch in one gallon of water; a covering or coat of the dry metallic powder is then carefully laid on the surface with a soft brush, and the cloth is afterwards dried. In some cases I prefer drying the piece after the starch or paste has been laid on, and afterwards wetting it again with cold water, by a brush on the face, or I immerse the piece upon which the starch or paste has been laid and dried in water, and after the immersion I pass it through padding rollers, so as to leave it uniformly wet. I then apply the metallic powder in the manner before mentioned: when perfectly dry, the piece must be well brushed with a hard brush, to take off all the powder which does not firmly adhere. I then pass the cloth through a friction calender of the ordinary description, employed in glazing calicoes, or I pass it over second hand cards, as hereinafter described, or I glaze it by hand.

The pieces, when thus finished, may have figures embossed upon them, or may be printed with colours, or varnish may be employed, to give various hues to the metallic face, or a watered effect may be given to the fabric. To produce the latter effect, I pass it again through the calender, which for that purpose must have a fine cotton or linen cloth wrapped round one of the cylinders, before the operation. In order to cover part only of any piece of cloth or other fabric, with a metallic surface, I pass the piece through a common or friction calender, in order to make the face firm and smooth to the touch; I then apply starch or paste by means of a machine, or block, or brush, over those parts of the fabric on which the figure is required. I then carefully apply the metallic powder with a soft brush, whilst the impression is wet as before described, until the piece is finished. The cloth is afterwards dried and brushed well with a hard brush, in order to remove all the superfluous powder that may attach to the piece. After this operation the piece must be passed through a slightly heated friction calender, or may be glazed by hand, so as to cause the raising or burnishing of the metallic surface required.

In order to produce the effect of matted or dead silver, I make use of old steel cards, (which have been previously used for carding cotton,) which I so fix upon a board, or in a frame, or in a roller, as that the piece of cloth, or other fabric, may be drawn against them

the smooth way of the card, until the metallic surface assumes a dead or matted appearance.

In order to apply my invention to yarns or thread, in the skein or hank, or in the warp, the same process must be gone through as is hereinbefore described, with respect to piece goods, taking care to use starch thinner in point of consistency. The starch which I use for this purpose, is made by dissolving about one pound of starch to one gallon of water; care must also be taken, that the threads be kept sufficiently separate and distinct, so as to admit of the metallic powder reaching and covering every part of the thread. The dressing machine, commonly used by power loom weavers, answers very well for that purpose.

In applying my invention to paper, I use the same process as is done in piece goods, except that when I again wet the starch or paste, which has been suffered to dry on the paper, I do it in all cases by applying water by means of a brush, as before described, and not by immersion in water. The starch used being of the consistency produced by dissolving about one pound and a half of starch in one gallon of water. In applying my invention to leather, the process is the same as is hereinbefore described, with respect to piece goods, except that I commonly use glue as the adhesive substance for fixing the powder firmly upon the leather, dissolving about four pounds of glue in one gallon of water, and the glue being used when quite hot, the powder being applied either immediately after the glue is put on, or after the glue has dried, and being again wetted in the manner before mentioned, in describing the process of applying the powder by means of starch, to fabrics of cotton, linen, or silk. The friction necessary to give the bright or burnished appearance, may be applied by hand, according to the nature of work required to be done. To produce the appearance of matted or dead silver, second hand cards may be employed as before described. Leather, which has been curried and polished, as for sale, is the best for the purposes aforesaid.

Although I have, in the previous description, stated the size of the vessel, and the description and strength of acid I use, and also that I prefer starch as the adhesive substance for attaching the powder to cotton, linen, or silk, either separately or mixed, or in yarns, or in the piece, or to paper, I declare, that the vessels in which the metals are revived or reformed may be adapted, in point of size, to the extent of the production required; and as tin is soluble by all, or most of the mineral, and some of the vegetable acids, that any of such acids may be used for dissolving the metal, although I prefer and use the muriatic acid; and I further declare that the strength of the acids and solutions employed may be varied, modified, and reduced according to the quantity of precipitate or revived metal required. And I also use starch, in preference to other mucilaginous or cohesive substance, as being more easily reduced to the consistency required by the nature of the work to be performed. And I declare, that I do not claim as my invention, either the solution of the tin or metal employed by means of muriatic or other acid, or the reviving or reforming of the tin or other metal, that process being

well known, or any part of my process taken separately, as the various operations are of constant occurrence in different manufactories; but I do claim, as of my sole invention, the combination and employment of the several operations, of reforming the tin or other metals, in a state of fine powder, the application of the metal, in that state, to the fabric used, and the use of a high degree of friction to raise a metallic surface or figure, at a much less expense than has hitherto been effected, such a result having been heretofore produced by methods in which these combinations have not occurred, and I claim such process, whether the whole be effected by hand or manual labour, or by the use and adaption of any machinery to the purpose. And I further declare, that although I have, in the foregoing description, exhibited my invention of giving a metallic surface to cotton, silk, linen, and other fabrics, by the employment of tin only, yet the same process may be used with corresponding results, whether that metal or silver, lead, bismuth, or antimony, either separately or in combination, is, or are, the metal or metals employed. And I therefore claim as my invention, the process or method of giving a metallic surface to cotton, silk, linen, and other fabrics, by the application of a metallic powder in manner hereinbefore expressed, whether the metal employed be tin, silver, lead, bismuth, or antimony, separately or in combination, and where the metal or metals employed, is, or are, first reduced to a powder, and where, after its application, friction shall be used in raising the metallic surface.

[*Rep. Pat. Inven.*

To JOHN HAGUE, *Engineer, for certain improvements in the method of Expelling the Molasses and Sirop from Sugar.* Dated December 6, 1828.

I, THE said John Hague, do hereby declare, that my invention consists in expelling the molasses or sirop from sugar, by occasioning a pressure of the atmosphere on a surface of the sugar, and this I do, either by withdrawing the air from the under surface, or by compressing this air on the upper surface of the sugar. When I do it by the first method, that of withdrawing the air from the under surface, I make use of a trough or box, (open at the top,) either square, round, or any other proper shape. I prefer having it larger at the top than at bottom, in order that when the sugar shrinks, by the expulsion of the molasses or sirop, it may, by sinking, keep tight round the sides, and thereby prevent the rapid passage of the air between the sugar and the sides of the trough or box.

In this trough or box, at a few inches, or any proper height from its real bottom, I put a false bottom, made of any proper material, (but I prefer sheet copper,) and thickly perforated with small holes; on this false bottom I place a cloth or web, made of hair or some other material.

To the real bottom. or sides of the above described trough or box,

I fix one end of a pipe or tube, the other end of which I fix to the upper side, or some other part of a receiving vessel, placed at a convenient distance below the trough or box. This receiving vessel I furnish with a cock, or some other contrivance, for the convenience of drawing off the molasses when desirable or necessary.

From some part of the above described pipe or tube, I branch off a tubular arm, which leads to an air pump, fixed at any distance from the already described apparatus. The construction of an air pump is so well understood by mechanical persons, that it needs not here being more particularly described.

The operation by this method is as follows:—

I spread the sugar about three inches deep, or any other proper depth, all over the cloth or web that covers the false bottom of the trough or box, taking care that the sugar comes close to the sides of the trough or box, all round. Next, by means of a water wheel, wind mill, steam engine, animal strength, or other power, I set the air pump to work, which partially exhausts the air from the other parts of the apparatus. A partial vacuum being thus formed underneath the false bottom of the trough or box, the pressure of the atmosphere, and the passage of the air through the sugar, separates and expels the molasses, which passing through the cloth or web, and the perforations in the false bottom, falls on the real bottom of the trough or box, and is from thence conducted, by the pipe or tube, into the receiving vessel below. This operation I continue, by keeping the air pump at work, until the molasses or sirop is sufficiently expelled from the sugar.

Before, or during the process, I sometimes find it desirable to moisten the sugar with water, lime water, or some other liquid.

When I do it by the other method, that of compressing the air on the upper surface, I make use of a trough or box, covered on the top, which I furnish with a false bottom, and cloth or web, as by the first method. The expelled molasses I convey from this trough or box, through an aperture, pipe, or tube, to any vessel, or place, destined to receive it.

The operation by this process is as follows:—

Having prepared, and spread on the cloth or web, the sugar to be operated upon, as by the former method, I, by means of a force pump, bellows, or some other contrivance, worked by some power, either natural or artificial, compress the air on the upper surface of the sugar, which produces the same effect on it as the operation first described. [*Ib.*

To GEORGE SCOTT, *Engineer, for certain improvements on, or additions to Windlasses, and relative Machinery, applicable to naval purposes.* Dated March 20, 1830.

THE patentee, in his specification, directs the "bits" of the windlass to be made of cast iron, and they are represented in the drawings of a trilateral form, having their angles rounded off. These

bits, or bearings, instead of being fixed, as in the windlasses of ordinary construction, are moveable on an axis formed near their base, and working in two additional bearings that are firmly affixed to the deck of the ship by any approved means. The beam of the windlass revolves on the centre of the bits, and is furnished with ratchet wheels and clicks as usual. A cross bar, secured by screws at either end, extends across the windlass above the beam, to prevent any distention of the bits, and to allow of the free action of the beam on its axis. Beneath each bit, and at a right angle with the axis, are placed several pairs of strong steel springs, similar to those employed in carriages, for which spiral springs may also be substituted varying in size and number, according to the tonnage of the vessel to which they are to be adapted. The effect of employing these will be, the counteracting any sudden strain or jerk of the vessel on the cable.

To attain this object more effectually, the patentee proposes to affix an additional apparatus to the cable, which is formed of two cylindrical boxes, the inner one so arranged as to slide within the other, and of sufficient diameter to admit of the passage of the cable to which it is intended to be applied. In the space between the two boxes are two or more helical springs placed one within the other, and consequently gradually decreasing in diameter, according to the number employed and the strength required. At one end of the apparatus is a stopper, formed of a moveable and a fixed jaw of metal, which grasps a link of the cable, and the whole is secured by two distinct pieces of cable attached to the bits of the windlass. When a strain is exerted on the cable, the inner cylinder is compressed as the progress of the former is arrested by the stopper before mentioned; and the springs, which are acted on by means of a small projection, extending around the inner cylinder, produce the elasticity required.

A modification of this latter apparatus is described, in which several pairs of flat springs, inclosed in a square metal box, with a sliding partition, are substituted for the helical springs and inner cylinder; and in conclusion the patentee states, that he does not confine himself to these two methods, but claims as his invention the use of springs generally, when applied to windlasses. [*Ib.*

To JOHN FREDERICK SMITH, *Esq. for certain improvements in preparing and Finishing Piece Goods made from Wool, Silk, or other Fibrous substances.* Dated February 12, 1830.

THIS patent is obtained for the application of the effect of centrifugal force, acted upon by a counteracting pressure, to the purpose of preparing and finishing piece goods of various fabrics, which is accomplished by an apparatus constructed as follows:—

A cylinder being affixed horizontally in bearings placed in the interior of a square box of proper dimensions, the fabrics to be operated on are wound around it, the ends of each successive piece being sewed or pinned to that already on the cylinder, so as to form

one continued length; and being passed alternately through three beams (similar to those used in ordinary gig mills,) in order to give it sufficient tension. A small bar is placed near the base of the cylinder, with a strap attached to it, extending the whole width of the cloth. This strap is passed over the cylinder, and is of sufficient length to encircle the whole. The opposite end to that affixed to the bar alluded to, is left loose; and this suspended part of the strap (which strap the patentee prefers to be made of Russia drill,) is kept distended by means of a small rod, extending the whole of its breadth, and a number of leaden weights, weighing together about five pounds. At one side of the box enters a steam pipe, from which an arm proceeds at right angles to it a short distance upwards, and extends across the under surface of the cylinder. This arm is perforated with numerous small holes, which throw jets of steam on the fabric as it is wound on the cylinder, that consequently impart a warm moisture throughout. This, it is stated, will much facilitate the operation, and give additional lustre to the cloth. The cylinder is caused to revolve quickly, when the centrifugal force exerted on the cloth is counteracted by the opposite pressure of the weighted strap above described, and produces an equable and excellent finish on the article. The rate at which it is desirable the cylinder should revolve, is about one hundred times in a minute; and this motion continued for about an hour and a quarter, will be found sufficient for general purposes, but the velocity and time of duration may be regulated according to circumstances.

It is observed, that in applying this process to fabrics of cotton, and silk, and to bombazeens and stuffs, the above method is all that is necessary to be adopted; but in worsted, or worsted and silk goods, it is expedient to subject them to the operation, both prior and subsequently to dying. With woollen cloths, an entire roll of Russia drill should be employed, extending through the whole length of the cloth, so as to keep it perfectly smooth; and the patentee recommends it to be then passed through the machine for which he obtained a patent on the 11*th January*, 1825, observing however, that this machine is then to be employed without the cutters. [*Ib.*

To WILLIAM GRISENTHWAITE, *Esq. for certain improvements in Steam Engines.* Dated February 12, 1830.

MR. GRISENTHWAITE commences his specification by informing us, that in the wheel described by Watt, which he caused to work by *mercury alone*, he employs pieces of iron, or other solid metal, in a small quantity of mercury, sufficient to float them, and he attaches rollers to reduce the friction, in case they should not float clear of the wheel. Instead of the hollow wheel, he sometimes substitutes a series of vessels, (of what shape we are left in ignorance,) which are fixed around the wheel, and have communication pipes proceeding alternately from the part of the vessel nearer the axis to that more distant from it.

A steam pipe passing through the centre of the axis of the wheel, communicates with a spiral tube, which revolves with the latter, and, (we presume,) is in consequence placed horizontally, though this is not explicitly stated: woven wire is wound around the spiral, and the bottom being immersed in cold water, it serves as a condenser.

The patentee occasionally employs mercury in lieu of oil, to lucubrate the bearings, which, he adds, may be also applied to machinery generally. The boiler is constructed of a series of pipes, connected with chambers, and pieces of flint or coke are directed to be placed between them, in order to "*filtre out*" the heat.

The above is an epitome of the specification, which is entirely unaccompanied with drawings, and evidently proceeds from a hand but little qualified to draw up a document of so much importance; however, we greatly doubt, whether much loss would be sustained, even if this circumstance were to be the cause of vitiating the patent. We may add, we were not before aware that Mr. Watt worked a wheel by "*mercury alone*," and require more substantial evidence before we credit the circumstance of his having been gifted with powers so miraculous. [*Ib.*

FRANKLIN INSTITUTE.

Monthly Meeting.

The stated monthly meeting of the Institute was held at their Hall on Thursday evening, October 28, 1830.

Mr. Henry Troth, was appointed chairman, and

Mr. F. Fraley, recording secretary pro tem.

The minutes of the last meeting were read and approved.

The following donations were presented to the Institute, viz.

By Mr. James Baker.

The Life of James Otis, of Massachusetts.

A Practical Treatise on Dying and Calico Printing, by Thomas Cooper.

A Narrative of a Journey to the Shores of the Polar Sea, by Capt. John Franklin.

Views of the Mines, Minerals, &c. of the Western Section of the United States, by Henry R. Schoolcraft.

A Memoir of John Aiken, M. D.

The Constitution of England.

The Science of Mechanics, by Z. Allen.

An Introduction to the Knowledge of Mineralogy, by W. Phillips.

La Fayette in America, in 1824 *and* 1825, *or a Journal of a Voyage to the United States.*

Memoirs of the old Schuylkill Fishing Company, and Gloucester Hunting Club.

The Young Artist's Assistant, or Elements of the Fine Arts, by W. Enfield, M. D.

By Mr. John O'Neill.

The Posthumous Works of Frederick 2nd, king of Prussia, 13 vols.

By Mr. Thomas Harper.

The Report of the Schuylkill Navigation Company, for 1822, 1825, 1826, 1827, 1828, *and* 1829.

By Isaac Hays, M. D.

The Fifth Annual Report of the Chesapeake and Delaware Canal Company.

The Library of Entertaining Knowledge, vol. 3. *part* 1.

By Mr. James Kite.

The Philadelphia Album, vols. 1st and 2nd.

By Mr. James Legare, of Charleston, South Carolina.

An Address delivered by the Agricultural Society in Charleston, S. C.

By Mr. Adam Ramage.

Two brass castings, (*heads of Franklin.*)

By Mr. D. M. Lewis.

A model of the roof of a house covered on the Russian plan, with sheet iron.

By Mr. B. N. Fyler.

A model of his improved stone rubber, and a model of his improved marble rubber.

By Mr. John Cook.

A specimen of medraporite.

By Mr. Thomas Fletcher.

A specimen of native gold from the mine of the Messrs. White, in Spottsylvania county, Va.

By Mr. John Ronaldson.

A specimen of gypsum, (*selenite.*)

The corresponding secretary laid on the table the following works, received in exchange for the Journal of the Institute, viz.

The Magazine of Useful and Entertaining Knowledge, for September.

The Mechanics' Magazine, and Journal of Public Internal Improvements, for September.

The American Journal of Education, for September.

The Illinois Monthly Magazine, for October.

The North American Review, for October.

London Journal of Arts and Sciences, for September.

The Mechanics' Magazine, for September.

The Register of Arts and Journal of Patent Inventions, for September.

The Repertory of Patent Inventions, for September.

Mr. Charles Potts submitted for examination a working model of a steam engine with his improvements, accompanied by a communication, which was read, and referred to the committee for publication.

Professor A. D. Bache made a verbal communication on the sub-

ject of fusible metal plates for locomotive steam engine boilers, and submitted a plan with drawings.

Professor W. R. Johnson, communicated several answers he had received to queries proposed by him on the subject of the explosion of the boilers of steam engines.

Mr. S. V. Merrick read a letter he had received from Mr. Charles M'Allester, jr. on the explosion of the boiler of the steam boat Caledonia.

On motion, the farther discussion of the explosion of steam boilers was postponed until the next meeting.

Henry Troth, *Chairman.*

F. Fraley, *Recording Secretary pro tem.*

Use of Chloride of Lime in the United States Navy.

We are happy to learn that in the United States sloop ———, recently returned from a cruise in the West Indies, the chloride of lime has been employed with good success. The offensive smell of the bilge water was instantly removed by dropping into it a small quantity of this article. The efforts of the officers to sweeten water for their table was not so successful. The smell was removed, but the taste of chlorine remained. Had they, however, passed the water through pulverized charcoal, previously well ignited, they would have obtained it perfectly healthy and pure. We have heard the bilge water in our packet ships loudly complained of: a useful hint may be taken by these vessels from the above.

Use of Chloride of Lime on board a Spanish fleet, in the summer of 1829; from the National Intelligencer of June 5th, 1830.

To the Editors.—We have been favoured with the perusal of the reports from the surgeons of the Spanish fleet, directed to the commandant-general of the station at Cuba, respecting the use of chlorine, which are highly interesting; affording additional evidence, if more could be required, of the extraordinary powers of that article, in changing an atmosphere rendered highly offensive and pernicious to health, to one devoid of effluvia, and perfectly salubrious.

On the 11th of July last, the fleet destined for the invasion of Mexico, conveying, in addition to the usual compliment of mariners, a large number of soldiers, was overtaken in the Gulf of Mexico by a violent tempest, which continued for several days. The severity of the storm rendered it necessary to remove the windsails, and to close, not only the ports of the lower gun deck, but likewise those of the main deck, and to place on the hatches. In this condition of the ships, with such a crowd of persons confined together, in the middle of summer, within the tropics, without fresh air, putrid fever and malignant dysentery soon made their appearance. The air is described as possessing, in addition to a highly offensive effluvium,

an acrid heat, burning to the skin, with a degree of density that arrested respiration and produced giddiness.

At this moment of distress and anxiety for the safety of all on board, the chlorine was used with the most decided and happy effects. Twelve vessels, containing one ounce each of the chloride of lime, in solution with water, were suspended on the birth deck, four were placed on the orlop deck, and two in the gun room. In the space of two hours, the atmosphere lost all its deleterious qualities, and became perfectly agreeable, leaving nothing perceptible but the smell of tar, which always exists more or less in ships. The solutions were renewed every twenty-four hours; but the chloride undissolved at the bottom of the vessels was then sprinkled on the decks, and thrown into such vessels as it became necessary to cleanse. During the whole of the campaign, which lasted three months and a half, the atmosphere was preserved in this pure state by the chlorine, to which all the surgeons unite in attributing the very few instances of death that occurred in the fleet, when there existed such fruitful sources of fatal disorders.

In these reports we find the experiments of Labarraque confirmed. Putrid meat, immersed for two hours in a solution of one part of the chloride of lime with forty parts of water, after being several times washed in fresh water, lost its disagreeable odour, and became as agreeable to the taste as if no putrefaction had ever taken place. It is likewise added, that the chloride never incommoded, in the least, the healthy or the sick. Two cases of pulmonary consumption were particularly noticed, in which not the least irritation of the lungs could be perceived.

While inviting public attention to the signal virtues of the chlorine, it should not be confounded with the disinfecting gases of Morveau and Carmichael Smith, so much condemned in Trotter's Medicina Nautica.* B.

[*Silliman's Journal.*

Note on the Fabrication of Blister, and Cast Steel, at Sheffield, in Yorkshire. By MM. Coste *and* Perdonnet.

Steel of cementation (blister steel,) is made at Sheffield, of Swedish iron, by a process which has been often described, and relative to which, we shall not therefore go into details, except to describe the cementing furnace, the exact dimensions of which we have been able to procure.

Figs. 1, 2, and 3, show the arrangement of the furnace. It is rectangular, and covered by an arched vault; it contains two cement-

* The quantity of the chloride of lime proposed to be furnished to a ship of the line, by the Spanish surgeons, in their report, is fifteen pounds a month, which in this city would cost about two dollars.

ing troughs, C, constructed of brick.* These troughs are two and a half feet wide, three feet deep, and twelve feet long; they are

Fig. 1.

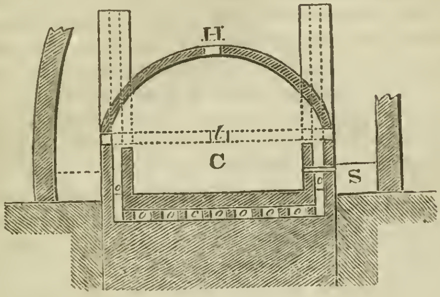


Fig. 2.

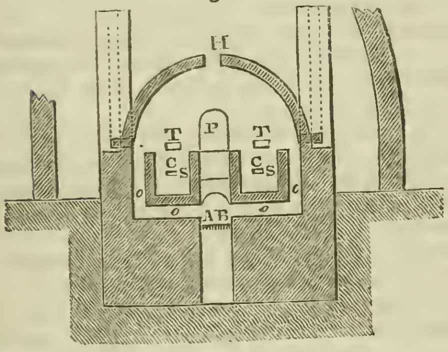
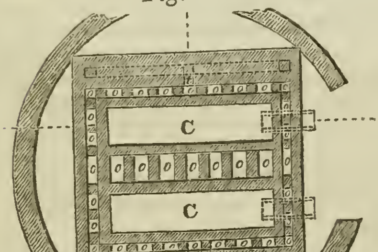


Fig. 3.



placed on each side of the grate, A, B, Fig. 2; the latter extends the whole length of the furnace, which is from thirteen to fourteen feet; it is fourteen inches wide, and is from ten to twelve inches be-

* These troughs are sometimes made of refractory stone.

low the bottom of the troughs. The height of the culminating point of the vault above the trough is five feet six inches. The bottom of the troughs is nearly on a level with the floor, so as to prevent the necessity of lifting the bars of iron very high in charging the furnace.

The flame rises between the two troughs, passes underneath, and circulates around them by openings, or vertical and horizontal canals, *o*, Figs. 1, 2, and 3; it issues from the furnace by an opening, H, in the centre of the vault, and by holes, *t*, which communicate with chimneys placed in the angles. Some furnaces are noted for a greater number of chimneys symmetrically disposed around the structure. In others, the partitions are pierced with vent holes, which are opened during the cooling. The whole furnace is situated in a vast cone of brickwork from twenty-five to thirty feet in height, open at the top. This cone increases the draught, regulates it, and conducts the smoke out of the establishment.

The furnace has three doors, two T, Fig. 2, above the troughs, which serve for the introduction and withdrawal of the bars; they are seven or eight inches square. In each of them is fixed an iron plate, turned up at the edges, on which the bars rub without injuring the wall. A workman enters by the middle opening, P, to arrange the bars; and by the holes, S, Fig. 1, in the sides of the trough, the trial bars are drawn out.

The bars are arranged in beds, in the cementing troughs, with powdered charcoal. They are about three inches wide and four lines thick. They must not be placed too near each other, lest they become soldered together. The last layer (which fills the trough,) is formed of clay, and is four or five inches thick.

The furnace is gradually heated, attaining its greatest intensity in about eight or nine days. The cooling, which must be progressive, lasts five or six days, and the whole operation from eighteen to twenty days, and sometimes longer, according to the intended quality of the steel. There are consumed, during this time, about thirteen tons of pit coal.

Fabrication of cast steel.—Cast steel is made of blistered steel or steel of cementation. It is broken into pieces, put into an earthen crucible, and heated in a common wind furnace. This furnace is a foot or fourteen inches square, and two feet deep.

It is closed on the top with a moveable cover composed of bricks bound together by an iron band. Several of these furnaces extend along a wall, and are connected with a wide chimney. The top of them is on a level with the floor, and their common ash pit is a cellar about ten feet high.

The crucibles, of very refractory clay, are sixteen or eighteen inches deep, and five inches in diameter. About forty pounds of steel are melted in them in five hours. In a state of fusion, it fills rather more than half a crucible; the latter are simply covered with an earthen slab. One of them will not serve for more than three operations.

No fuel is used but good coke; that which has been prepared in ovens is preferred. The melted steel is poured into moulds held

perpendicularly, and when full, an iron weight is laid on the top to prevent the melted metal from boiling out of the mould, but not so heavy as much to increase its density. [*Ann. de Chimie.*

Practical observations on the Pneumatic Process for Expelling Molasses and Sirop from Sugar.

A PAMPHLET has recently appeared with the above title, written by a Mr. Crosley, who states himself to have superintended, for many years, and on an extensive scale, the pneumatic process for expelling molasses from sugar; it contains some useful and practical information on the subject, although blended with much personal invective against the original inventor and patentee, Mr. Hague.

Of the points of disagreement between the above named parties, and their relative merits, it is not our intention to treat, but shall confine ourselves simply to extracting such portions of the pamphlet as we may consider of general utility, with this view we select the following:—

[*Ed. Rep. Pat. Inven.*

Observations on the Apparatus and Operation upon Raw Sugar, according to the specifications of Mr. Hague's patents.

THE withdrawing of the air from the under surface of the sugar, is decidedly the only mode of effecting, upon a scale of business, the expulsion of the molasses or uncrystallizable sugar, containing the carbonaceous and other substances adhering to each crystal of raw sugar. Molasses, properly so called, is the uncrystallizable part of the cane juice, and the greatest portion of it separates, by its own gravity, from the raw sugar, during the period of the curing, in the colonies, as the sirops and treacle separate from the refined and bastard sugar during the operation of claying.

Compressing the air upon the upper surface of the sugar, is only suitable to experimental workings in domed vessels.

The first method, as described by Mr. Hague's specification, is effected in a trough, or box, square, round, &c. The pans which the writer found best suited to operations of business, were oblong squares, of various dimensions, made of wrought or cast iron; the former, if made in a proper way, are to be preferred.

In these pans the false bottom is placed at a proper distance from the upper edge of the pan, according to the depth or quantity, and quality of the sugar intended to be at one time operated upon. In lieu of sheet copper, thickly perforated with holes, as described in the specification, a wooden bottom, properly made, will answer best, which may or may not be covered with wire work, according to the construction of the wood. The hair cloth is placed on the false bottom, which must be fixed in the iron pan in such way, as to pre-

vent the passage of the air at the edges or sides; and unless the false bottom and the sides are thus properly secured, a considerable portion of the cleared sugar will pass into the extracted sirop below, and other effects be produced detrimental to the operation.

The sugar with which the trough or box is to be charged, is, according to the specification, to be "*previously moistened regularly with water, lime water, or some other liquid.*" Such was the first operation of the patentee on a pound of sugar, and, with the great power used by him, it was effectual; but when he followed the same principle upon a larger scale, it was clearly ascertained that, *by mixing water with the sugar previously to charging the pans*, the desired effect *could not be obtained.* The complexion and appearance of the sugar under operation was so discouraging, from the irregularity of its working, and the deterioration in lieu of improvement, became so apparent, and increased the longer the action of the atmosphere was upon the sugar, that any person making the experiment, in the way described by the specification, or viewing the first operations of the patentee upon a hogshead of sugar, would, like the gentleman who first became interested in this invention of "*certain improvements*," as they are called, have turned from it in disgust, or abandoned the concern altogether as he did.

The raw sugar must be prepared previously to being operated upon by the pneumatic process, and the writer found that such preparation was most essentially requisite; that a difference in preparation is necessary, according to the qualities of the sugar to be operated upon; that, without a strict adherence to this first necessary point, the operation would fail altogether; and that the operation could *only be performed by subsequently moistening the sugar during the operation, from time to time, varying as the quantity and quality of the sugar varied*, and that such moistening was not to be effected by certain quantities, but *by uncertain quantities of water* or liquid, according to the skill of the workman; that moreover it was necessary, during the whole operation, to be attentively watchful to *regulate, by the barometer and by appearances, the pressure and passage of the atmospheric air:* several other minutiæ of manipulation are requisite to produce an improved sugar, and a regular discharge or expulsion of the molasses, as it is called, not in one pan only, but in several pans of various qualities of raw sugar, working by one and the same main of pipes, connected with the air pumps. The writer also found, that unless the mode of operation before in part described, with many other very important particulars, which can only be known by practical observation, be strictly observed, the process could not be rendered available, and completely effective, for the purposes of business.

By the patentee's method, the separation of the molasses commenced at the bottom, or under surface of the sugar resting on the false bottom. By the writer's improved method, the separation commences at the upper surface, and thereby the pan is half discharged of the improved sugar, ere any portion of the extracted colouring matter has passed through the false bottom into the space below.

By the patentee's method the sugar soon becomes, by the pressure of the atmosphere, a mass resembling clay; and if, perchance, upon two or three inches thick, by a great power, an extract is obtained, (which then can only be got by subsequent waterings,) the quantity of cleared crystals is considerably reduced; whereas, by the improved method, the sugar is kept free, a less quantity of water is used, and the weight of cleared sugar is considerably greater, perhaps from ten to twenty pounds per cwt. more. Indeed, so sparing was the writer of the use of water, that he actually worked, with success, a pan of sugar by *steam only*, which condensed upon the surface of the sugar, and yielded a valuable and beautiful product. This latter mode seemed not suited to the management of workmen, as it required too nice a discrimination and attention.

A comparison of sundry methods for Expelling the Molasses and Sirop from Raw Sugar.

1*st.* *The Pneumatic Process.*

By the pneumatic process, raw sugar of any quality, and in any quantity, can be completely cleared from the colouring matter adhering to its crystals, in the space of from six to twelve hours, by means of air pumps; the liquid generally employed, to obtain the partial solution of the raw sugar, is pure water, according to the purposes the cleared sugar is intended for, whether to resemble crushed or clayed sugar for sale, or for the immediate or deferred use of refining. The cost of power by steam engine, labour, and all incidentals, under a proper management, in London, (where coals are at a higher price than in the country,) is about four-pence to six-pence per cwt. on the raw sugar. The crystals of sugar are not crushed by pressure, or deteriorated by the action of heat; on the contrary, the cleared sugar is rendered stronger for the purposes of refining, and is of richer saccharine quality than any other sugar whatever, manufactured by the application of heat. The pneumatic sugar does not contain more impurities, nor yield a greater loss when refined, than in lumps; it can be used for bottoming up of certain descriptions of refined goods, thereby saving the destruction, for that purpose, of inferior lumps, as is customary in refineries; it is superior to lumps when melted for further processes of refining, because the sugar has been produced without the aid of heat, which, in proportion to the degree employed, and repetition of the application, weakens the crystallizing properties of sugar, and engenders molasses, and the colouring substance which adheres to the crystals of sugar, whether the first products of the cane, (raw sugar,) or the after products, (refined sugar, lumps, and loaves.) The impure part, or coating of the crystals, is effectually separated in a state of solution, and when properly worked, yields, by evaporation, a regenerated raw sugar, suitable for another operation by the pneuma-

tic process, or it may at once, (after filtration,) be blended with the sirops then in course of refining, and made into lumps. Again, if the refiner should prefer making the first products of the raw material into loaves or lumps of an inferior quality, he can, by the use of the process, separate a portion only of the colouring matter, and the quantity of raw sugar so cleared, will be greater in proportion to the inferiority of the quality required, or very inferior raw sugars may be discharged of their colouring matter, and then refined into loaves and lumps of fine quality. In the refineries, where a steam engine is at present employed, the power thereof might be in part detached during the other workings of the house, and wholly so after those workings were finished, to complete the pneumatic operation upon the quantity required for the refine of the following day. The process can also be employed upon bastard sugar, which yields a beautiful product, generally equal in colour to that obtained from raw sugar, but inferior thereto in point of strength and quantity, for reasons hereafter named. The prices obtained for bastard sugar, must, however, govern this second operation upon the residue of a refine. Such cleared sugar, from bastard, might be suitable to the consumption of the grocers, for increasing the colour of sugars for the scale.

2nd. Claying Process.

The process of claying raw sugar is so well known, that a description of it would be superfluous; suffice it to say, that claying is only adapted to the discharge of the molasses and colouring matter adherent to the crystals when new, or immediately after they have been obtained by evaporation; it is, therefore, suitable to the colonies only, and not to Europe. It was attempted in this country, about forty years ago, to discharge, by means of claying, the colour remaining in union with raw sugar; and it is remarkable, that this attempt by claying was made in the very buildings then called the Claying Sugar Houses, and in the same rooms where the pneumatic process was first effectually employed; and the coincidence is still more striking, as nearly similar troughs or pans were employed. £100,000 was expended, and the attempt abandoned, after a few years of trial.

Thus, that which had been tediously and imperfectly performed by claying, and the action of gravity, was, forty years afterwards, expeditiously and completely effected, by the intervention of a well known principle, by pure water, and by mechanical power.

3d. Hydraulic Process.

The process of discharging the molasses or colouring matter, by the hydraulic or other presses, is known to every refiner; and, therefore, a particular description of the operation is unnecessary. Raw sugar, to be thus operated upon, requires considerable labour in the preparation; and, when so prepared, is reduced to a species of expressed pulp, in which a considerable portion of the colouring matter

still remains, and the crystals are broken; for these reasons such sugar is only fit for refining.

4th. Process of Meltings.

The process of meltings being the one in use, particularly in those refineries worked on the late Mr. Howard's principle, requires a more especial notice and comparison with the pneumatic process. The advantages of the latter have been stated; the former is well known to every refiner of sugar; but it is proper to observe, that meltings produce an imperfectly cleared sugar by various operations, requiring much room and labour, in about as many days as the pneumatic process requires hours to produce pure and perfectly cleared sugar; and these prompt and efficacious results are accomplished by a cheap operation, not injurious to the crystallization of the products. In short, to work meltings as a primary procedure in refining, is, in fact, a single refine of the raw sugar, before it is further operated upon for finer products.

The deteriorating effects of heat upon saccharine solutions are universally admitted; the advantages of this improved system of separation must, therefore, be evident, and must apply to the cane juice, and to all solutions, whether of raw, clayed, or refined sugar, and to the sirops which exude, or are discharged therefrom by the various methods of working. [*Rep. Pat. Inven.*

Account of the Liverpool and Manchester Rail-way.

The following description of the Liverpool and Manchester railway, is derived from an official account of the work, by Henry Booth, Esq. treasurer to the company of proprietors,* and a "description of the rail-way," by James Scott Walker.

The Plate, No. II. exhibits a plan and section of the rail-way, with the branch lines, adjacent canals, roads, &c.

Explanation of the Section.

A, inclined plane from Wapping to Edgehill (part of the tunnel.)	Length	1970 yds.	rise 1 in 48.
a, level. - - - -	"	1000 "	
a, *a*, Wavertree, Broad Green, Roley, Huyton, - - -	"	$3\frac{1}{8}$ miles,	fall 1 in 1092
B, Whiston inclined plane, -	"	$1\frac{1}{2}$ "	rise 1 in 96
b, Rainhill level, - -	"	$1\frac{7}{8}$ "	
C, Sutton inclined plane, -	"	$1\frac{1}{2}$ "	fall 1 in 96
c, over Parr Moss to the Sankey canal and viaduct, - - -	"	$2\frac{1}{2}$ "	fall 1 in 2640

* An account of the Liverpool and Manchester rail-way, comprising a history of the parliamentary proceedings preparatory to the passage of the act: a description of the rail-way, and a popular illustration of the mechanical principles applicable to rail-ways; also an abstract of the expenditure, &c. By Henry Booth, treasurer to the company.

D, Sankey to Newton, E, Newton to Bury Lane,	"	$6\frac{1}{2}$	"	fall 1 in 880
F, Chat Moss, - - -	"	$5\frac{1}{2}$	"	rise 1 in 1200
G, Barton, Eccles, Salford, Manchester, - - - - - -	"	$4\frac{1}{2}$	"	level
g, level of Water street.				

The Liverpool end of the rail-way may be properly said to commence in the company's yard in Wapping, a short distance from the north end of the Queen's Dock. Here the lower entrance of the great tunnel is approached through a cutting 22 feet deep and 46 feet wide, affording space for four lines of rails, between which there are ranges of lofty cast iron pillars, supporting beams and flooring of an elegant pile of warehouses erected over or across the excavation. In the spacious area thus formed beneath these warehouses, the finer sorts of goods are to be received from, and delivered to, the warehouse keepers, by means of hatchways in the floors above, to the precise spots beneath which the wagons may be pushed on side rails fixed for the purpose, and communicating with the main double line of rails by means of turning rails, fixed on large moveable circles of wood. Wagons loaded with coal or lime are to pass underneath the warehouses to the open wharfs at the Wapping end of the station. The tunnel is 22 feet wide and 16 feet high; the sides are perpendicular for 5 feet in height, and surmounted by a semicircular arch of 11 feet radius. The height from the roof of the tunnel upwards to the open surface of the ground, varies from 5 to 70 feet. Where the natural rock could not be united to support the superincumbent mass, an artificial arch work of brick has been introduced. For about 270 yards from its mouth, the tunnel curves to the right, or south-east; the visiter then reaches the bottom of the inclined plane, (A in section,) the rise of which, (1 in 48,) is regularly maintained to the farther end of the tunnel at Edgehill, a distance of 1970 yards. From the bottom of this inclined plane the light may be seen, on a clear day, at the upper end of the tunnel. The appearance to a keen eye is that of the upper hemisphere of the moon seen dimly through a hazy cloud, and diminished almost to a speck in the distance, as if viewed through an inverted telescope. This feeble light gradually increases in size and brightness as the traveller advances, and when within half a mile of it, if the atmosphere be particularly fine, a letter may be distinctly read without the help of a candle. To view the tunnel, however, to the greatest advantage, it should be visited when illuminated by gas. The public had first an opportunity of thus gratifying their curiosity, in the month of July, of the last year, when it was opened by the directors. "It was lighted by jets, 30 yards apart, fixed from the roof throughout its whole extent, and the effect was grand and beautiful. The lights nearest the spectator appeared a considerable distance apart. Farther on they approximated in the perspective, and finally became blended into a continuous and brilliant line of flame, fading away from a pure white to a fine red colour. The whitened roof and

sides, contiguous to each light, were so strongly illumined, that the whole vista appeared like a succession of superb arches, formed through massy parallel walls, the intervening spaces being left in comparative darkness."*

On emerging from the tunnel at Edgehill, the traveller enters a spacious area 40 feet below the surface of the ground, cut out of the solid rock, and surmounted on every side by walls and battlements. Immediately on the left he perceives the mouth of another tunnel, parallel with the entrance of that from which he has just emerged, but of smaller dimensions, being only 15 feet wide and 12 feet high. This smaller tunnel is 290 yards long, inclines upwards in a direction opposite to the other, and terminates in a large yard in Crown street, which is the principal station for the rail-way coaches, and is intended to serve also as a coal depot, for the supply of the higher districts of the town. Proceeding onwards, the visiter passes through a Moorish archway, (at present unfinished,) which connects two houses, appropriated to stationary engines, which are intended to draw loaded wagons up the inclined plane from the Wapping end of the tunnel. This structure is from a design of Mr. Foster, an architect, who has contributed greatly to the embellishment of Liverpool, but who has not always displayed so pure a taste as he has done in this instance. The chimneys of the two engine houses, which are connected together by this archway, are carried to the height of about 100 feet, and form two very striking additions to the scene.

The traveller now finds himself on the open road to Manchester. The descent as far as Huyton, (*a*, *a*, in section,) is so slight and uniform as not to be perceived by the eye, but is still sufficient to give a considerable mechanical advantage to a load passing in that direction. The road a little beyond Wavertree is carried through a deep marl, cutting under several massive stone archways; and beyond this we enter a ravine, cut through the solid rock of Olive Mount, for the depth of 70 feet. "This cutting is the largest in stone on the whole line, is little short of two miles in length, and is one of the most remarkable portions of the whole undertaking. It is at once unique and picturesque. The traveller here finds himself on a fine level road upwards of 20 feet in width, but which is seen for a great extent both ways, and walled in, as it were, with solid rock, rising almost perpendicularly on each side to a height of 70 feet, appears to be of more contracted span; and so diminutive a creeping creature does a man appear at the bottom of the chasm, that the spectator marvels that it is the work of human industry, and is lost in the calculation of the millions of blows with the pick-axe, the amount of human toil, and sinew, and skill, that must have been exerted to remove so prodigious a mass of matter."† The sides of the rock exhibit already the green surface of vegetation, and have,

* "Description of the Rail-way," by James Scott Walker: Liverpool, 1830.
† Walker.

altogether, a more natural appearance than might be expected from so recent an excavation.

The materials dug out of Olive Mount, to form the ravine just described, have served to construct a lofty embankment which next carries the rail-way across the valley of Roby, at a height of from 15 to 45 feet. "Here the traveller finds himself affected by sensations the very reverse of what he felt a few minutes before. Mounted above the tops of the trees, he looks around him over a wide expanse of country, in the full enjoyment of the fresh breeze from whatever quarter it may blow. There is a feeling of satisfaction by no means common-place, in thus overcoming obstacles, surmounting difficulties, in making the high places low, and the rough places plain, and advancing in one straight and direct course to the end in view."*

The inclination of Whiston plane, (B in section,) is so slight that it would scarcely attract notice, did not a decrease in the speed of the carriage indicate that a material alteration had taken place in the facility of draught.

After advancing about half a mile on the Rainhill level, (C in section,) the turnpike road from Liverpool to Manchester passes over the line of rail-way at a centre angle of 34 degrees, by means of what is popularly called a skew bridge. The span of the arch is 54 feet, though the breadth of the rail-way is only 30; and each face of the arch extends diagonally 45 feet beyond the square. It was on this Rainhill level that the experiments took place with the locomotive engines in the month of October last.

Sutton inclined plane, (C,) is similar in extent and inclination to the Whiston plane, the top level being 82 feet above the base of each plane. The road as it passes over Parr Moss, (*c*,) seems to be only four or five feet above the surface; but this embankment, which was formed of the materials dug out of the Sutton inclined plane, is in reality 25 feet thick, having sunk about 20 feet into the Moss.

Over the Sankey Valley and canal, and over the topmasts of the barges, the rail-way is carried along a viaduct of nine arches, each 50 feet span, built principally of brick, with stone facings. The height from the top of the parapets to the water in the canal, is 70 feet, and the width of the rail-way between the parapets, 25 feet.

Another viaduct of four arches, each of 30 feet span, and 40 feet high, carries the rail-way over the valley of Newton. Under the eastern arch passes the turnpike road from Newton to Warrington; and beneath another arch flows a stream, which turns an old corn mill immediately below the bridge.

A few miles beyond Newton we come to the Kenyon excavation, from which above 700,000 cubic yards of sand and clay were carried off to form the neighbouring embankments; the remainder, "deposited as spoil-banks, may be seen heaped up like Pelion upon Ossa, towering over the adjacent land." Near the end of this cutting, the Kenyon and Leigh Junction rail-way joins the Liverpool and Man-

* Booth.

chester line, by two branches pointing to the two towns respectively. This rail-way joins the Bolton and Leigh line, and thus forms the connecting line between Bolton, Liverpool, and Manchester.

The road over Chat Moss is not inferior to that on any part of the line. This hitherto barren waste comprises an area of about 12 square miles, varying in depth from 10 to 35 feet. Towards the Manchester end of the Moss, several neat slated cottages, rows of recently planted trees, belts of wood, and patches of arable land, present indications of the task of reclaiming it having been commenced. The establishment of this Moss farm, has its origin, with "a few spirited individuals who have, in conjunction with Mr. Baines, laid a private rail-way from the main line, at this point, extending to the river Irwell, a distance of nearly two miles, crossing the Warrington and Manchester road, eight miles from the latter. This new *creation* of productive land, which is like a green and grateful spot in the surrounding wilderness, has been effected in the short space of eighteen months, and furnishes a remarkable and important example of the combined power of agricultural and mechanical science: for it is admitted, that but for the use of rail-ways, it would have still remained in its natural sterility. The rail-way employed, which is moveable, is the invention of Mr. Edward Evans, of Liverpool, one of the proprietors. It is in lengths of four yards, each fixed on a longitudinal wood sleeper, a section of which would be an isosceles triangle—the base being the longest side, and serving as a continuous support for the rail upon the moss. These rails may be laid and shifted, so as to serve an acre of ground with marl or manure for half a crown, a small portion only of manual labour being required to propel the wagons. Marl has been extensively used on this farm, which is intersected, or cut into fields, by large principal drains, into which run small under drains, *roofed* with the *top* sod of the moss itself, and at short distances: by these the superstratum is effectually bled of its redundant water. This successful example of skill and industry, will, no doubt, lead the way to the cultivation of the whole of the Moss, which, it is computed, contains an area of twelve square miles."*

From Chat Moss the rail-way passes over the lowlands at Barton, extending about a mile between the Moss and Worsley canal, by means of an embankment; it is carried over the canal by a neat stone viaduct of two arches; it then proceeds through Eccles and a portion of Salford, under six bridges: it is carried over the Irwell by a handsome stone bridge of sixty-three feet span, thirty feet from the water, and then over twenty-two brick arches, and a bridge over Water street, to the company's station in Water street, Manchester, a distance of thirty-one miles from the Liverpool station. The rail-way is there on a level with the second story of the company's warehouses, and by six large doors, or gateways, the wagons may be rolled into them and conveniently discharged or loaded under cover. The

* Walker.

north front of these warehouses leads into Water street, with which the ground floor is level.

In the *construction* of this rail-way, the first part on which operations commenced, was Chat Moss, the draining of which was begun in June, 1826. In September of the same year, the first shaft of the Liverpool tunnel was opened; and early in 1829, the earth work, (*i. e.* the cuttings and embankments,) along the whole line was in progress. During the whole of 1827, the formation of the tunnel under Liverpool was carried forward with spirit and perseverance. Night and day the excavation proceeded, and many difficulties in the execution of the work had to be overcome. In some places the substance excavated was a soft blue slate, with abundance of water; in other places a wet sand presented itself, requiring no slight labour and contrivance to support, till the masonry which was to form the roof was erected. In passing under Crown street, near the Botanic Garden, for want of sufficient props, the superincumbent mass fell in from the surface, being a depth of 30 feet of loose moist earth and sand. On some occasions the miners refused to work; and it not unfrequently required the personal superintendence and encouragement of the engineer to keep them at their posts. But while some portions of the tunnel were excavated under circumstances of no little difficulty and danger, other portions were hewn through a fine red sand stone, clean, dry, and substantial, and requiring neither props nor artificial arching; the natural rock forming the roof of the excavation. The tunnel was constructed in seven or eight separate lengths, communicating with the surface by upright shafts, through which the substance excavated was conveyed away. On the 9th of June, 1828, it was reported to the directors that the last joining between the several lengths was effected, and at that period all very serious difficulties in the execution of this branch of the undertaking, were surmounted.

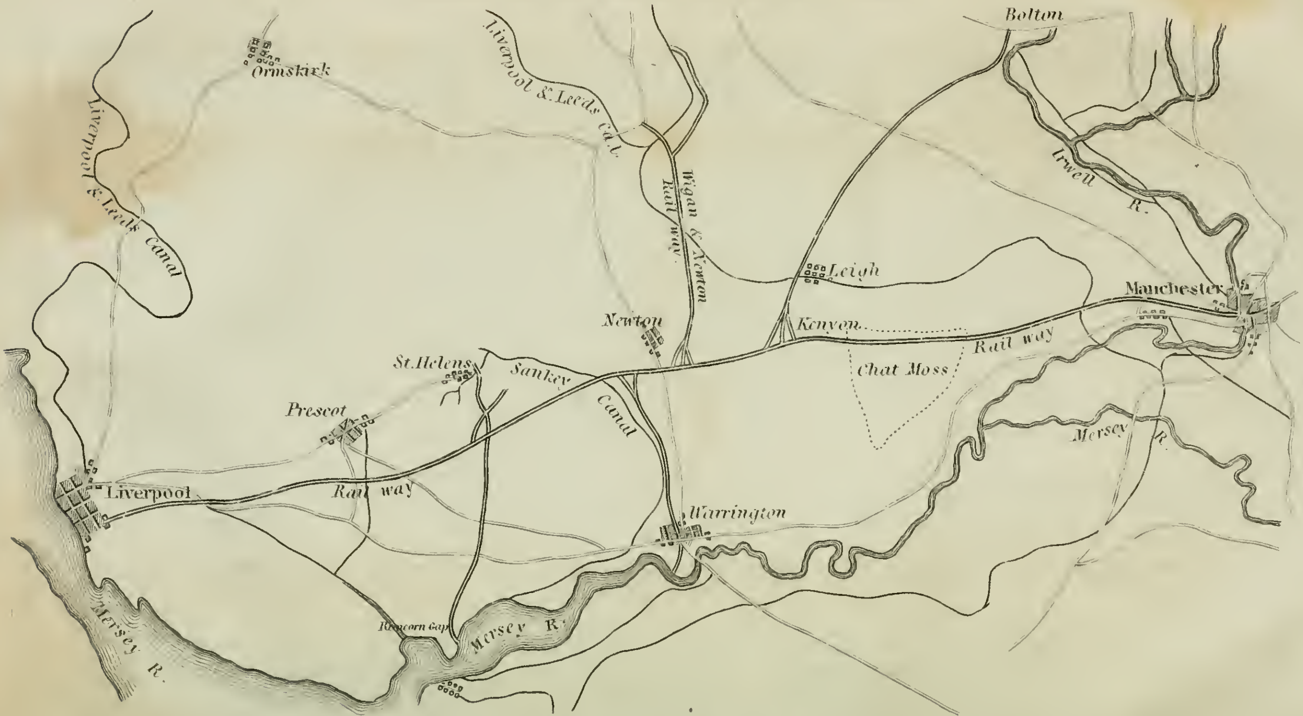
In 1828, principally, was effected the piling for the foundations of the piers of the great viaduct over the Sankey Valley; a business of much labour and cost, but indispensable for the security of the superstructure. About 200 piles, varying from 20 to 30 feet in length, were driven hard into the foundation site of each of the ten piers. The heavy ram employed to impart the finishing stroke, hoisted up with double purchase and snail's pace to the summit of the piling-engine, and then falling down like a thunderbolt on the head of the devoted timber, driving it, perhaps, a single half inch into the stratum below, is well calculated to put to the test the virtue of patience, while it illustrates the old adage of "slow and sure."

During 1828, was completed the company's bridge over the turnpike road, and the old mill dam at Newton, and the operations at Chat Moss were carried on without intermission—embanking at each end, and draining, levelling, &c. in the centre portions.

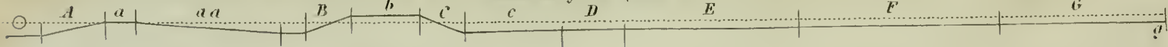
In the spring of 1829, the directors being desirous of proceeding with increased despatch in the execution of the work, instructed the engineer to order the contractors, at the principal cuttings throughout the line, to employ two sets of labourers, and to work by night

PL. II. VOL. VI.

PLAN OF THE LIVERPOOL AND MANCHESTER RAIL WAY.



Section of the plan.



as well as day. The operations accordingly proceeded still more rapidly than heretofore, though it must be allowed at considerably increased expense; and had it not been for the extraordinary wet summer and autumn, the earth work for a complete line of communication between Liverpool and Manchester, might have been accomplished by the end of 1829, or the beginning of 1830, and the rail-way laid down for operations within a few months from that period. As it was, very considerable delay was occasioned by the heavy and long continued rains, besides no trifling expense to the company in pumping the water from the deep cuttings, which were too apt to assume the appearance of a canal rather than a rail-way.

The principal structure completed in 1829, was the company's bridge to carry the Liverpool and Warrington turnpike road over the rail-way at Rainhill.

Before the close of 1829, one road-way along the whole extent of Chat Moss was completed; and on the 1st May, 1830, the Rocket steam engine, with a carriage and company, passed over it. That the practicability of carrying the rail-way over this Moss should have been questioned, is not to be wondered at, considering that it was in some places from 30 to 35 feet deep, and so soft and pulpy that an iron rod would sink through it by its own gravity. The portion of the Moss which presented the most difficulty, was about half a mile on the eastern border, where an embankment of about 20 feet had to be formed above the natural level. The weight of this embankment resting on a semi-fluid base pressed down the original surface; many thousand cubic yards gradually and silently disappeared before the line of road made any approach to the proposed level. By degrees, however, the whole mass beneath, and on each side of this embankment, became consolidated by the superincumbent and lateral pressure, and a little perseverance finally completed the work.

In September, 1829, was commenced the company's bridge over the Irwell—the last great structure on the line of rail-way from Liverpool to Manchester.

The expenditure for the rail-way, up to the 31st of May last, amounted to £739,185 5*s.* 0*d.* In a report dated the 25th of March last, the directors estimated that the total expenditure, including warehouses, machinery, and carriages, would amount to 820,000*l.* but it is supposed that it will not fall much short of 1,000,000*l.* We have not space in this number to give the items of expenditure.

Account of the preparatory experiments for determining the kind of Carriage to be used, and the power to be employed, on the Liverpool and Manchester Rail-way.

Numerous plans were proposed to the directors for facilitating locomotion on the rail-way. Every scheme which the restless ingenuity or prolific imagination of man could devise, seem to have been

liberally offered to the company; the difficulty was to choose and decide.

The great theatre of *practical* experience on rail-ways, was previously the Stockton and Darlington line, and the rail-ways in the vicinity of Newcastle-on-Tyne. All the modes heretofore in use of propelling carriages on rail-ways; namely, by horses, by locomotives, and by fixed engines, had been there exemplified. Facts were wanted to lead to a correct decision, and personal observation seemed necessary in order to arrive at a satisfactory result. The directors accordingly appointed two of their own body, accompanied by Mr. Booth, their treasurer, to proceed to Darlington, and the neighbourhood of Newcastle, to obtain, on the spot, the requisite information, and to report the same to the Board, with their opinion on the subject. This journey of inspection took place in the beginning of October, 1828, and the deputation returned with a fund of information—but of so mixed, and, in some respects, of so contradictory a nature, that the great question as to the comparative merits of locomotive and fixed engines was as far from being settled as ever. One step only was gained; the deputation were perfectly convinced that for the immense traffic to be anticipated on the Liverpool and Manchester line, horses were out of the question. In these circumstances the directors resolved on calling in the assistance of two professional engineers, to enable them to determine which it would be best to adopt, fixed or locomotive engines; and the gentlemen selected for this purpose were Messrs. Walker and Rastrick.

On the 9th of March, 1830, two separate reports from these engineers were laid before the directors. The merits and demerits of each system were therein very fully and fairly stated; and in the opinions of Messrs. Walker and Rastrick, they were pretty equally balanced. The cost of an establishment of fixed engines between Liverpool and Manchester, they were of opinion, would be something greater than of locomotives to do the same work; but the annual charge, including interest on capital, they computed, would be less on a system of fixed engines than with locomotives. The cost of moving a *ton* of goods thirty miles, that is, from Liverpool to Manchester, by fixed engines, they estimated at 6.40*d.* and by locomotives, at 8.36*d.* supposing in each case a profitable traffic *both ways.* But with a system of locomotives, the cost of the first establishment need only be proportioned to the demands of the trade, while with stationary engines an outlay for a complete establishment would be required in the first instance. And it was farther to be considered, that there appeared more ground for expecting improvements in the construction and working of locomotives than of stationary engines. On the whole, however, and looking especially at the computed annual charge of working the road on the two systems on a large scale, Messrs. Walker and Rastrick were of opinion that fixed engines were preferable, and accordingly recommended their adoption to the directors.

Mr. Stephenson, the company's engineer, had always been in favour of locomotive engines, and notwithstanding this decision of

Messrs. Walker and Rastrick, he was still decidedly of opinion that they would be found to furnish the most economical and most convenient moving power that could be employed. The leaning of a majority of the directors continued also in favour of locomotives, provided they could be constructed to consume their own smoke, (agreeably to the provisions of the rail-way act,) and of adequate power, and of a less weight than the engines then in use, which were generally from 8 to 10 tons in weight; the consequence of which was no small injury to the rail-ways, and a proportionate expense in keeping the road in repair. The directors, therefore, determined to obtain, if possible, a locomotive engine, of improved construction, that should comply with these conditions. Mr. Harrison, (one of the directors,) had been for some time of opinion, that the excitement of a reward publicly offered by the company would be the most likely means to obtain for them what they were in search of. In this opinion his brother directors now coincided; and hence the competition, which took place in October last, with all the particulars of which the readers of the "Mechanics' Magazine"* were made fully acquainted at the time.

From this date the question between locomotive and fixed engines was considered to be practically settled. The fitness of locomotives for the purposes of travelling at almost any speed that could be desired, was strikingly exemplified. But there still remained one point to be settled, namely, the *kind of power* to be employed in ascending the inclined planes of Whiston and Sutton. These planes are each a mile and a half long, with an inclination of 3-8ths of an inch to a yard, being a rise of 1 in 96. Stationary engines on the summit, with ropes passing over sheaves or pullies along the whole ascent, are the means resorted to at the inclined plane in the Liverpool tunnel; also on the Darlington inclined planes, and at the collieries in the North. It was quite evident, however, that such a plan of operations in the centre of the Manchester and Liverpool line, with the interruption to be expected from a *change* of the moving power, to say nothing of the danger always to be apprehended from a system of ropes and pullies, was to be avoided if possible. It became an object, therefore, of no small interest, to ascertain the power of the new locomotives on the planes in question. During the trial at Rainhill, in October last, "The Rocket" frequently ascended the Whiston inclined plane with a carriage holding from twenty to thirty passengers, at a speed of from fifteen to eighteen miles per hour; and the ease and regularity with which this was effected, produced a general impression, that even up inclined planes the locomotive engine would be the power employed. Indeed, the feeling at the moment was very prevalent, that it was immaterial whether the engine travelled up an inclined plane or on a level: but subsequent experiments have fully established what it would have been only reasonable to assume *à priori*, that the power of an engine diminishes in proportion to the degree in which the plane is inclined

* See this Journal, vol. v. p. 186, 257.

till it reaches a point when adhesion terminating, the wheels turn round without advancing; and that, therefore, without assistance of some sort up such inclinations as those of Whiston and Sutton, an engine must either go at a less speed, or draw a less weight. For example, "The Comet" locomotive, a new engine on the same plan as "The Rocket," ascended the Whiston inclined plane with about twenty-six tons behind her, with a speed diminishing from the rate of between sixteen and eighteen miles at the commencement, to about three or four miles per hour before she reached the top: but it would be quite erroneous from these data to take the average between three and eighteen, and to infer that the power of the engine was equal to convey a load of twenty-six tons up an inclination of 1 in 96 at $10\frac{1}{2}$ miles per hour; her real power, estimated in a continuing speed with the above load, being only three or four miles, or proportionate to about seven tons up the same plane at fifteen miles per hour.*

On the 14th of June, of the present year, an experiment was made as a preliminary measure to a general opening, well calculated to exhibit the peculiar character of rail-way conveyance, and to put to the test the capabilities of the locomotive engine, both on a level and up inclined planes. On this occasion the directors, in two carriages, proceeded on a journey of inspection from Liverpool to Manchester, and back. "The Arrow," another of Mr. Stephenson's engines, was the proving power. The gross weight drawn was about 33 tons, consisting as follows:—

	Tons.
Stone in seven wagons, - - - - -	20
Weight of wagons, - - - - - -	7
Engine tender and six persons, - - - -	3
Two carriages and twenty persons, - - -	3
	33

With this load she travelled from the Engine House, Liverpool, to Old Field Lane Bridge, Salford, Manchester, the distance being about 29 miles in 2 hours and 25 minutes, including two stoppages to take in water. Up the Whiston inclined plane she was assisted by "The Dart," an engine of similar construction and power; and the first quarter of a mile of the ascent was accomplished at a speed of 17 miles per hour before the summit was gained, the mile and a half being accomplished in 12 minutes; the average speed being, therefore, $7\frac{1}{2}$ miles per hour. At the top of the ascent "The Dart" was unyoked, and "The Arrow" proceeded with her cargo along the straight and level plane at Rainhill at the rate of 16 miles per hour. On the return from Manchester the engine, tender, and the two carriages, with passengers, constituted the whole load drawn.

* It is worthy of remark, in connexion with this branch of the subject, that in considering the section for a proposed rail-way, the *length* of the inclined planes should be taken into the account as well as the steepness of the ascent; since on a plane half a mile long, it is evident much more may be accomplished than on one three or four times that length.—Mr. Booth.

The first $9\frac{1}{4}$ miles from Old Field Lane Bridge to Glazebrook Bridge, including the Chat Moss district, were accomplished at a speed averaging from 19 to 20 miles per hour. The whole distance was accomplished in 1 hour and 46 minutes, including stoppages, the speed generally varying from 18 to 25 miles and upwards per hour, and the engine not working to her full power a great portion of the way. The speed up the Sutton inclined plane, (without any assistant engine,) averaged more than fifteen miles per hour. The day was wet, and the rails in some places very dirty; the whole performance, therefore, took place under circumstances by no means favourable, but the result was highly satisfactory.

[*Mechanics' Magazine.*

Cloth of Amianthus.

THE method of preparing amianthus for the purpose of making incombustible cloth, is thus stated in an Italian Journal.

The amianthus is exposed to the action of steam, in a vessel made for the purpose, and which will hold more than 3000 pounds of the mineral, and so that all parts of it may be acted on by the steam. The fibres, by this action, become loosened, and acquire so much flexibility that they are easily separated, so as to obtain thread as fine as silk, and of several decimetres (about four inches) in length.

[*Annales d'Hygiene Publique and Silliman's Journal.*

Notice of the Remarks of the Editor on the Taps and Dies patented by A. LAMONT.

TO THE EDITOR OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

SIR,—Your love of candour will undoubtedly induce you to give a place in your Journal to some notice of your remarks upon the taps and dies patented by me in January last. In your number for April, p. 228, you urge some objections against these dies, which experience has proved do not exist. You say that "if a thread could be cut the whole depth at once, they would act well, but, this, generally, is out of the question." This, sir, is just the case with these dies, for they always cut their full depth at once passing down, and when it is requisite that the thread of the screw should be deep, I use two pairs of dies, following each other in succession.

You also say that "only one cutting thread can be in action at once, and that the most prominent." The reverse of this is the fact, for the last prominent thread cuts first, and every thread in the dies is cutting at the same time. The screw in the dies being an entire circle, adds greatly to their value; for in consequence of this, every screw cut by the same dies, will be of one exact size. Every kind of screw can be cut in this way with the greatest facility and precision.

All the objections that you urge to my improvement are applica-

ble to dies made in the common way, and as your remarks will be received with confidence by the great body of mechanics, you will oblige me by publishing this correction.

Very respectfully, &c.

ARCHIBALD LAMONT.

Pittsburgh, November 1, 1830.

Remarks by the Editor.—As Mr. Lamont's description, attached to his patent, said nothing about the use of different pairs of dies in succession, there was nothing to justify the conclusion that such was his practice. We observed, in speaking of the dies, that "if a thread could be cut the whole depth at once, they would act well." We know enough about cutting screws, to pronounce this impracticable with single dies, excepting in small screws, but with successive dies the object can, undoubtedly, be attained.

In cutting deep threads, in large screws, two, three, or more taps, must also be required. We do not believe that any power which could be applied to a tap would enable it to cut, at once, the box for a standing press screw, or rather, we are certain that any tap would be broken by the power which would be required to force it through.

The foregoing observations are not offered as objections to the plan of Mr. Lamont, which, with his present explanations, we admit to be practicable, and have no doubt whatever of its utility. To what extent it may be applicable, experience alone can decide.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Letter from Mr. J. DOOLITTLE, *respecting the* EDITOR'S *remarks on* Mr. PERKINS' *and* SMITH'S *Paddle Wheels.*

To William Hamilton, Esq. Actuary of the Franklin Institute, Philadelphia.

SIR,—I am happy to learn by Dr. Jones' remarks, appended to my communication to you, on the subject of Mr. Smith's paddle wheels, contained in the last number of the Journal, that my surmise was correct, when I supposed that the specification, or the drawings, or both, had been inadequate to convey a correct notion of the invention, as I saw it. Certainly no person could recognise the features of the child in the portrait drawn by the father.

I do not regret this occurrence, as it affords an additional proof of the impartiality and discriminating judgment of Dr. Jones, for whom I feel a very high respect. It proves also that we were both in the dark, he as it related to the real value of the invention, and myself as regarded his means of appreciating it.

These points being now cleared up, I accept with pleasure the hand of friendship which he proffers.

I am, with much respect, &c.

J. DOOLITTLE.

Bennington, Vt. November 15th, 1830.

INDEX.

AMERICAN PATENTS, LIST OF, WITH EDITOR'S REMARKS, &c.

			PAGE
	April.		
1.	Spinning cotton, machine for	Charles Danforth, -	1
2.	——— woollen slubbing,	Austin Steele, - -	2
3.	Thrashing machine, -	William C. Ross, -	ib.
4.	Candles, machine for making dipped	Thomas M. Scott, - -	ib.
5.	Horse shoes, improvement in	Sumner King, - -	3
6.	Temple, self-operating -	Ephraim R. Otis, - -	ib.
7.	Sawing shoemakers' lasts, &c.	Seth Carsley, - -	ib.
8.	Propelling boats, -	Timothy Beach, - -	4
9.	Chain paddle wheels, -	Andrew Rogers, -	ib.
10.	Pill boxes, manufacturing -	Nathan Crary and Edw. P. Crary,	ib.
11.	Weaving rugs and carpeting,	William Bacon, - -	5
12.	Cutting mouldings in wood,	Samuel Kennedy, -	ib.
13.	Cutting screw thread in brass, &c.	Richard Whitney, - -	6
14.	Iron dogs for saw mills, -	Anson Andrews, -	7
15.	Churn, - -	Isaac F. Waring, - -	ib.
16.	Thrashing machine, - -	James Cooper, -	ib.
17.	Dogs used in saw mills, -	J. Pierce and J. and A. Whitley,	8
18.	"Saving lock" for furniture,	Elijah Skinner, - -	ib.
19.	Temples, revolving bar -	Ed. B. Harris and Andw. R. Arnold,	ib.
20.	Iron dogs for saw mills, -	Martin Rich, - -	9
21.	Water wheel, reacting, -	G. W. Henderson & J. E. Cayford,	ib.
22.	Grinding, &c. hard substances,	Barton N. Fyler, - -	10
23.	Pipes for aqueducts, &c. &c.	Thomas B. Armistead, -	ib.
24.	Washing machine, -	Richardson P. Clarke, -	ib.
25.	Sugar, manufacturing raw -	William A. Archbald, -	11
26.	——————— -	——————— -	ib.
27.	——————— -	——————— -	ib.
28.	Wool, &c. manufacturing pantaloons from - -	J. Foster and J. Stoughtenburgh,	ib.
29.	Carpets, taking the figures of	William Sherwood, -	ib.
30.	Churn, - -	Asael Curtis, - -	ib.
31.	Water wheel, improved -	Paul Boynton, - -	ib.
32.	Steam boiler, improvement in	Henry M. Shreve, -	12
33.	Plough, improved cast iron	Derick Barnard, - -	ib.
34.	Saw cotton gin, -	Phineas Gardner, -	ib.
35.	Washing machine, - -	Hezekiah Thurber, -	13
36.	Ink distributor, self-moving	John Prince, - -	ib.
37.	Boring holes in rocks, -	Israel Overall, - -	ib.
38.	Boots and shoes, water proof	Samuel Eells, 2nd, -	14
39.	Distilling, improvement in -	Charles F. Fisher, - -	ib.
40.	Breast, apparatus for drawing the	Elihu Blake, - -	ib.
41.	Lamp for burning lard, -	Stephen P. Morehead, -	15
42.	Gun lock, concealed percussion	Joel Newbury, -	16
43.	Veneers, machine for glueing	Benjamin Hinkley, -	ib.
44.	Churn, - -	Abner Bristol, -	ib.
45.	Shaping hammers, &c. &c. -	Ezra L'Hommedieu, -	17
46.	Cutting scale boards, shingles, &c.	Josiah Fairfield, -	ib.
47.	Hats, sizing and napping -	George Henning, - -	ib.
48.	Glue, improved mode of making	Peter Cooper, - -	18
49.	Mortising improved mode of	Abner Foster, - -	ib.
	May.		
1.	Wagon Lock, - -	Samuel Jones, - -	73

		PAGE
2. Calendar, perpetual -	John O'Hara, - -	74
3. Carpet loom, - -	Josiah R. Clark, -	ib.
4. Rice, cleaning paddy, or -	John L. Norton, - -	ib.
5. Thrashing machine, - -	Noah Lindsey, -	ib.
6. Cutting grass, &c. machine for	Erastus Ingersoll, - -	75
7. Cooking stove, - -	John Moore, - -	ib.
8. Spindles for spinning, &c.	Benjamin Brundred, -	76
9. Boot fronts, crimping -	Joseph H. Punchard, -	ib.
10. Staves, mode of dressing -	Charles B. Goodrich, -	77
11. Cooking furnace, portable	Asael Cross, - -	ib.
12. Thrashing machine, -	Samuel S. Allen, - -	ib.
13. Hats, machine for napping -	A. P. Gregory, -	78
14. Nail machine, - -	Joseph Hearsey, - -	ib.
15. Cooking apparatus, - -	Joseph Jennings, -	ib.
16. Thrashing machine, -	Jas. Douglass and Walter Johnson,	79
17. Pasteboard, &c. manufacture of	Isaac Sanderson, - -	ib.
18. Piano fortes, improvements in	Charles P. Sakmeister, -	ib.
19. Endless chain rail-way, -	Samuel Lane, - -	ib.
20. Bedsteads, improvement in -	Williams Wooley, -	80
21. "Fin steam vessel," -	Antoine Batby, - -	ib.
22. Thrashing machine, -	Samuel Fisher and David Sperry,	81
23. Spinning, improvement in	John Brown, -	ib.
24. Distilling, improvement in	William Berkley, - -	82
25. Jointing staves, - -	Charles B. Goodrich, -	ib.
26. Fountain pen, - -	D. W. Hyde, - -	83
27. Tallow, &c. mode of burning	Isaiah Jennings, -	ib.
28. Hemp, &c. breaking and dressing	John Rich, Jr. - -	ib.
29. Corn mill, double pendulum	M. B. Poitiaud, -	85
30. Street pumps, improvement in	Martin Mettee, - -	ib.
31. Thrashing rice, - -	Jehiel Butts, - -	145
32. Twine, manufacturing seine	Alston Pond, - -	ib.
33. Pails, &c. improvement in making	Palmer Phillips, -	146
34. Teaching reading, drawing & writing,	Charles Varlé, - -	ib.
35. Piano forte action, improved	Charles Saltenstall Seabury,	147
36. Washing machine, -	Andrew Kirkpatrick, -	ib.
37. Plough, improved - -	Charles Rawling, - -	ib.
38. Washing machine, -	James M. Gates, -	148
39. Cutting paper, &c. machine for	Francis B. Howell, -	ib.
40. Foundations of marine rail-ways,	Jas. Ronaldson and John L. Neill,	ib.
41. Felt, mode of making -	Thomas Robinson Williams,	ib.
42. Spinning rope yarn, &c. -	James Church, Jr. -	149
43. Propelling boats by machinery,	Josiah Copley, - -	ib.
44. Cogs for ships' blocks, &c. -	Rhodes Kingsbury -	150
45. Gold, improved mode of washing, &c.	T. W. A. Sumter, - -	ib.
46. Furnace for cooking, portable	Wm. A. Haggerty, Thos. C. Lawrence, and Thomas Frazier,	151
47. Piano fortes, mode of stringing	Alpheus Babcock, -	ib.
48. Thrashing rice, machine for	Ephraim Sands, - -	ib.
49. Brushes, cloth and hair -	Herrick Aiken, -	152
50. Saw set, improvement in -	———— - -	ib.
51. Spinning cotton, machinery for	James Bogardus, -	ib.
52. "Labour-saving machine," -	Ichabod Lewis, - -	153
53. Plough, - -	Samuel Nisbet, -	ib.
54. Sawing, mortising, &c. machine for	Benjamin Overman, -	154
55. Churn, - - -	Iram Brewster, -	ib.
56. Ships, machine for lifting	Thomas Evans, - -	ib.
57. Portable furnace, -	Asher W. Roberts, -	ib.
58. Glass makers' moulds, -	Deming Jarvis, - -	ib.
59. "Chemical catholicon," -	Isaac W. Smith, M. D. -	155

		PAGE
60. Washing machine, - -	Enoch Walker, - -	155
61. Cooking stove, - -	Lewis Peterson and P. Peterson,	156
62. Washing machine, - -	Stephen Hinds, -	ib.
63. Water wheel, applying water to the	Edward Pritchard, - -	157
64. Steam engine, improvement in	Charles Potts, -	ib.
June.		
1. Auger, machine for boring and withdrawing the - -	John Sneider, - -	217
2. Nail machine, - -	J. Brett and E. Gilmore,	218
3. Blasting rocks, new mode of -	Moses Shaw, - -	ib.
4. Timber rail-road, -	James Stimpson, - -	219
5. Thrashing machine, - -	David Flagg, Jr. -	220
6. Cotton whipper, revolving	Elisha Baker, - -	ib.
7. Saw mill, improvement in -	Eli Mobley, . -	221
8. Hoops, splitting and manufacturing	Ziba Bisbee, - -	222
9. Axle-trees for wagons, &c. -	John A. Yerkley, -	ib.
10. "Detector," for steam boilers,	Thomas Ewbank, - -	223
11. Rake, iron tooth - -	N. Sanford and E. P. Parmelee,	ib.
12. Wheel, inclined plane -	George Wood, -	ib.
13. Plough, - - .	Jacob Yeager, - -	ib.
14. Stove and open fire-place, -	Anthony Savage, -	ib.
15. Brick press, - -	Julius Willard, - -	224
16. Wood, mode of sawing -	James Hamilton, -	ib.
17. Gasometers, improvement in	Henry B. Williams, -	225
18. "Explosion guard," -	J. Loughead and T. B. Chapman,	ib.
19. Thrashing machine, -	John Peters, - -	ib.
20. Spring scales, - -	Daniel Klanberg, - -	226
21. Compass needle, improvement in	Moses Smith, -	ib.
22. Washing machine, - -	Robert C. Arnold, - -	ib.
23. "Geometrical protractor and tablet,"	John Pool, Jr. -	ib.
24. Grain, machine for washing, &c.	Gilbert Arnold, - -	227
25. Washing machine, -	Ebenezer Horton, -	ib.
26. Soda water, mode of making	George Ott, - -	ib.
27. Saw teeth, gumming and cutting	Phineas Newton, -	228
28. Furnace for stone coal, -	John Estlin, - -	ib.
29. Steam boiler, vertical, -	Ezra L. Miller, -	ib.
30. Silvering and gilding leather,	Levi Kenton, - -	229
31. Fire-places, construction of -	Ebenezer Lester, -	ib.
32. Cooking stove, - -	Andrew C. Betts and Eli M. Gibbs,	ib.
33. Clay for bricks, preparing, -	Nathaniel Adams, -	ib.
34. Nap upon woollen cloths, raising, &c.	Thomas Hurd and Jesse Fox,	230
35. Thrashing machine, -	Squire Gambell, - -	231
36. Spinning, making roving in cotton	Samuel P. Mason, -	ib.
37. Rail-road carriage, - -	Joseph V. Hughes, -	ib.
38. Paper, improvement in finishing	Thomas Gilpin, -	232
39. Washing machine, -	David Stocking, - -	ib.
40. Churn and washing machine,	Hezekiah Kingsbery, -	ib.
41. Machine for transporting manure, &c.	Isaac Beach, - -	ib.
42. Baggage on coaches, securing	Charles Stratton, -	233
43. Thrashing machine, -	Asher Slover and William Sparey,	ib.
44. Spinning wool, machine for -	John Pierce, - -	234
July.		
1. Grain, machine for cleansing	Jesse Neal, - -	289
2. Loom for weaving casinet, &c.	Jas. Hammond and J. M'Clelland,	290
3. Flouring mills, improved -	Jonathan Thompson, -	ib.
4. Rail-road and street car, -	John Pollock, - -	291
5. Looms, improvement in -	John Goulding, - -	ib.
6. Rail-ways, revolving turn-out for	Jonas P. Fairlamb, -	ib.
7. Window blinds, mode of fastening, &c.	William Phelps, - -	292

		PAGE
8. Thrashing grain and breaking flax, &c. - -	David Ball, - -	292
9. Staves, machine for sawing, &c.	Daniel Toms, - -	293
10. Grist mill, improved -	Charles Langford, -	ib.
11. Thrashing machine, -	Jas. H. Arnold and Jesse Bonsall,	ib.
12. Judkin's ointment, improvement in	Nathan Shepherd, -	294
13. Breaking stone and thrashing grain,	Wm. H. Bell and T. P. Andrews,	ib.
14. Paint, preparing oil and spirits of turpentine for - -	John J. Pendergast, -	295
15. Hemp and flax, dressing -	Abel Smith and James Olney,	ib.
16. Thrashing machine, elastic bed for	David Flagg, Jr. - -	ib.
17. Shot, &c. machine for making	Julius Willard, -	ib.
18. "Water elevator," -	Enoch Honeywell, -	296
19. Bedsteads for the sick, -	Avery Smith, - -	ib.
20. Cloth of flax and wire, -	Peter Laporte, - -	297
21. "Double spinner," - -	Ethan Bowen, -	ib.
22. Thrashing machine, -	John Stowits, - -	298
23. Rail-way, improvement in -	Edward Dunscombe, -	ib.
24. Churn, - -	Moses Granger, - -	ib.
25. Cross cutting, &c. wood, -	Aaron H. Foot, -	299
26. Rotary pump, - -	Ebenezer R. Hale, -	ib.
27. Stamping brass, &c. machine for	Jacob Stroop, - -	ib.
28. Rolling mill for carriage springs,	George Stoudinger, -	300
29. Soap, use of steam in making	Bernard Zell and James Doyle,	ib.
30. Thrashing machine, - -	Amos Lupton and John Lupton,	ib.
August.		
1. Paper from wood, -	Lewis Wooster and J. E. Holmes,	301
2. "Franklin cracker machine,"	N. Daskam and David G. Wood,	ib.
3. Paper, machine for making -	E. H. Thomas and N. Woodcock,	ib.
4. Music type, cutting and casting	George B. Lothian, -	ib.
5. Margaric, stearic, and oleic acids, making - -	H. Seybert and L. Vanuxem,	ib.
6. Ropes, &c. machine for making	S. F. Dexter and Saml. Graves,	302
7. "Floating excavator," -	Wm. Morrison and George Tomb,	ib.
September.		
Machine for cutting biscuits, &c. &c.	Jos. Clark and Henry Henderson,	ib.
October.		
1. Fulling mills and power looms,	Anson Atwood, - -	361
2. Lamp reflector, - -	Edward Brown, -	362
3. "Wire lock spring," -	Job Baker, - -	ib.
4. Hulling Rice, &c. &c. &c. &c. &c. machine for . -	Joseph Beach, -	363
5. Percussion lock and vent for cannon,	Lieut. William H. Bell, -	ib.
6. Canal boats, &c. mode of propelling	Henry Ovinel, - -	364
7. Crackers, &c. machine for cutting	Thomas Bladen, - -	ib.
8. Clocks, wheels, pinions, &c. for	John P. Bakewell, -	ib.
9. Conduits for conveying water or gas under ground, -	John M. Benham, - -	ib.
10. Saccharifying rye, &c. -	A. J. Brasier, -	365
11. Saccharifying rice and maize,	———— - -	ib.
12. Thrashing machine, -	Robert L. Caustin, -	ib.
13. Friction rollers, construction, &c. of	David Baldwin, - -	366
14. Hill side plough, - -	John P. Cobbs, -	ib.
15. Ferry boats, and mode of propelling	Matthew D. Brown, -	ib.
16. Specific for the cure of ague and fever,	Maurice Cannon, -	367
17. Floating graving dock, -	Thomas Cunningham, -	ib.
18. Milk, extracting cream from	Samuel Davis, -	368
19. Rail-road car, - -	John Elgar, - -	ib.
20. Topping to chimneys, -	Joshua Ennis, - -	ib.

		PAGE
21. Doors, preventing water, &c. passing under	Samuel Durfee,	369
22. Pressing machine,	Lecter E. Denison,	ib.
23. Scouring floors, machine for	David Dickinson,	370
24. Churning machine,	Philip Cornell,	ib.
25. Rotary steam engine,	Ezekiel Childs,	ib.
26. Cotton roping, machine for making	Joseph C. Dyer,	371
27. Water wheel for propelling machinery,	James Johnson,	ib.
28. Gold, machine for digging for, &c.	Henry Jordan,	372
29. Grain, machine for cleaning,	William C. Henley,	ib.
30. Rotary propelling engine,	John G. Hotchkiss,	ib.
31. Washing the wool on sheep, &c.	Charles Harris,	ib.
32. Paper hats water proof, rendering	Benjamin Grut,	373
33. Standing press, improvement in	George W. Grater,	ib.
34. Spiral axle for clocks, &c.	Abijah Gould,	ib.
35. Pen, perennial fountain	Marcus T. C. Gould,	374
36. Gold, &c. from earth, separating	Roswell King,	ib.
37. ————————	————	ib.
38. Mortising and tenoning, machine for	Elisha Mudge,	375
39. Stock and hand vice,	Enoch D. M'Cord,	ib.
40. Bar share plough,	Adam Mitchell,	ib.
41. Auger, single twist, &c.	Ezra L'Hommedieu,	ib.
42. Soap by steam, manufacturing	John Kennedy,	376
43. Distillation from Indian corn, &c.	Dan Samson,	ib.

Ainger, on using alcohol, &c. in the steam engine, 68
Aldini's apparatus for resisting fire, 212
Alum, mode of making—*patent*, 246
Alloy for pumps and cocks, 288
Anthracite, use of in blacksmiths' shops, 198
Amianthus, cloth of 419
Antiques, modern, by the Editor, 38, 279
Antiquity of paper making, 267
Arago on the explosion of boilers, 44
Area of an irregular figure, to find 337
Artificial pearls, making of 287

B

Blacksmiths' shops, use of anthracite in 198
Blake's case and types, plan of 282
Blasting of rocks, 62
Blowpipe simplified, 144
Boats, horse 279
Boilers, on the explosion of steam 33, 44, 327, 332
———, detectors for steam—*patent*, 234
———, experiments with Braithwaite and Ericsson's 347
Bostock on writing ink, 208
Bottles, proving the strength of 353
Brass, Varley's mode of condensing 210
Bricks, &c. ornamental—*patent*, 244
Bricks, machine for making—*patent*, 243
Bridge, remarks on the Jackson 110
———, Long's remarks on wooden 252
Brown sugar from the cane, making—*patent*, 21, 23

C

Candles, mode of burning tallow, oil, &c. as—*patent*, 94
———, wax from castor oil for 284
———, method of making—*patent*, 313
Cane, preparing the juice of the—*patent*, 19

PAGE
Cane, making raw sugar from the—*patent*, - - - 21, 23
—— juice, concentrating—*patent*, - - - - 100
Carpets, taking the figures from ingrain—*patent*, - - 18
Carpet loom, improved ingrain—*patent*, - - - 88
Car, rail-road—*patent*, - - - - - - 379
Cart propelled by wind, - - - - - 40
Cast iron wheels with wrought iron spokes, - - - 360
Cement for iron water pipes, - - - - 216
Chloride of lime, use of - - - - - 401
Chlorine, test of the strength of - - - - 143
Circular motion, mode of communicating - - - 37
Cleaning wheat, machine for—*patent*, - - - - 382
Clock wheels and pinions of glass—*patent*, - - - 385
Cocks and pumps, alloy for - - - - - - 288
Colour, manufacture of enamel - - - - 257, 338
Colour from dye woods, extracting—*patent*, - - - 170
Compass needle, improved—*patent*, - - - 238
Condensing brass, Varley's mode of - - - - - 210
Copal varnish, - - - - - - - 72
Copper sheathing for ships—*patent*, - - - - 172
——— with platina, plating—*patent*, - - - 176
Cordage, &c. improvements in making—*patent*, - - - 99
Cotton, &c. giving a metallic surface to—*patent*, - - 391
Cotton seed, oil from - - - - - - 141
Colour from dye woods, mode of extracting—*patent*, - - 170

D

D'Arcet on the art of refining, - - - - - 133
Detector for steam engine boilers—*patent*, - - - 234
Detonating powder, remarks concerning - - - 108
Distillation, improvements in—*patent*, - - - - 97
Distilling, improvement in apparatus for - - - 316
Doublet, Wollaston's microscopic, - - - 56
Dye woods, extracting colour from—*patent*, - - - 170

E

Editor's remarks on American patents for April, - - 1
———————————— May, - - 73, 145
———————————— June, - - 217
———————————— July, - - - 289
———————————— August, - - 301
———————————— September, - - 302
———————————— October, - - 361
————— on Archbald's patents for sugar making - - 25
————— on Foster and Stoutenberg's for felting - 26
————— on Otis's for a self-operating temple, - - 28
————— on Gregory's for napping hats, - - 93
————— on Ewbank's detector for steam boilers, - - 236
————— on Smith's compass needle, - - 240
————— on fire proof covering for houses, - - 256
————— on Doolittle's letter on paddle wheels, - 311
Editor, modern antiques by the - - - 38, 279
Elastic force of vapour, - - - - - 135
Enamel colours, manufacture of - - - - 257, 338
English patents, - - - 28, 95, 163, 241, 313, 391
Evaporating sugar, improvements in—*patent*, - - - 163
Explosions of boilers, proceedings of Franklin Institute on - 33
Explosions of steam boilers, Arago on - - - 44
——————— Potts on - - - 327
——————— D. J. Burr on - - - 332
——— in the drum and pipe of a stove, Hare on - - 337

PAGE

F

Felting, making garments of wool by—*patent*, - - - 25
Figures from ingrain carpets, taking the—*patent*, - - 18
Filtering apparatus—*patent*, - - - - 95
Flame, apparatus for protecting persons exposed to - - 212
Fountains of fresh and salt water, - - - - 286
Fountain pen, perennial—*patent*, - - - 383
French works in straw, - - - - - 117
French patents, - - - - - 173
Friction rollers—*patent*, - - - - - 380
Fulminating powders for fire-arms, - - - 130, 201
Fusible metal disks for steam boilers, - - - - 60

FRANKLIN INSTITUTE.

Monthly meeting, minutes of - - 31, 106, 177, 251, 326, 399
Explosions of boilers, proceedings relating to the - - 33
————————, report relating to, - - - ib.
————————, circular letter relating to, - - - 35
Quarterly meeting, minutes of - - - - 102, 317
———— report, - - - - - 104, 318
Report on premiums and exhibitions, - - - 271
———— silk and silk goods, - - - - 319
———— cotton goods, - - - - - 322
———— hardware, - - - - - 324

G

Garments of wool by felting, making—*patent*, - - 25
Generating steam, apparatus for—*patent*, - - - 30
Glass, flattening cylinder window—*patent*, - - - 378
Glass paper, substitute for - - - - - 139
Glass wheels and pinions—*patent*, - - - - 385
Glue, improvement in making—*patent*, - - - 87
Globes, improved mode of constructing—*patent*, - - 171
Grain, &c. &c. mode of preserving—*patent*, - - - 95
——, saccharifying various kinds—*patent*, - - 386, 387
Gun lock, percussion—*patent*, - - - - 86
————, improved—*patent*, - - - - 99
Gypsum, mode of making - - - - 262

H

Hats, machine for napping—*patent*, - - - - 91
——, new construction for—*patent*, - - - 241
Horse boats, - - - - - - 279
Houses, expense of covering the roofs of - - - 255
Howard on communicating circular motion, - - - 37

I & J

Indigo, on the manufacture of - - - - 193
Ingrain carpets, taking the figures from—*patent*, - - 18
—————— loom, improved—*patent*, - - - 88
Ink, Bostock on writing - - - - - 208
Institute, Pittsburgh Mechanics' - - - - 281
Iron, improved mode of making—*patent*, - - - 168
—— water pipes, cement for - - - - 216
—— cast wheels, with wrought iron spokes, - - 360
Jackson bridge, remarks on the - - - - 110
Juice of the cane, preparing the—*patent*, - - - 19

K

Kiln, improved malt—*patent*, - - - - 98

L

Lac, shell and seed, query on - - - - 360
Laws, observations on the patent - - - - 113
Lights, phosphorus match—*patent*, - - - - 176

	PAGE
Lime, test of the strength of chloride of - - - -	143
Liquids, &c. &c. mode of preserving—*patent*, - - - -	95
Lithographic transfers, mode of making - - - -	138
Liverpool and Manchester rail-way, opening of - - -	215
Liverpool and Manchester rail-way, account of - - -	409
——————————— carriages for - - - -	415
Lock, percussion gun—*patent*, - - - - -	86
——, improved gun—*patent*, - - - - -	99
Loom, improved ingrain carpet—*patent*, - - - -	88
Long's Jackson bridge, remarks on - - - - -	110
Long, on the location and construction of rail-roads, - - -	178
Long's observations on wooden bridges, - - -	252
M	
Magnet, notice of a large - - - - -	284
Malt kiln, improved—*patent*, - - - - -	98
Marine rail-ways, foundations of—*patent*, - - - -	158
Match lights, phosphorus—*patent*, - - - - -	176
Mechanics' Institute, Pittsburgh - - - - -	281
Melting pots for iron and steel, - - - - -	127
Metallic surface given to cotton, &c.—*patent*, - - -	391
Metals, on polishing - - - - - -	265
Mexican plumbago, query concerning	288
Microscopic doublet, Wollaston's	56
Microscopes, improvements in	349
Modern antiques, by the Editor, ...	38, 279
Molasses, expelling from sugar—*patent*, ...	395
Mortising machines, notice respecting	163
Motion, mode of communicating circular	37
———, economical mode of transmitting	38
——— to a piston, communicating vertical . . .	39
Music type, art of cutting and casting—*patent*, ...	309
N	
Napping of hats, machine for—*patent*, ...	91
Needle, improved compass—*patent*, ...	238
Notice of a large magnet, ...	284
O	
Oil from cotton seed, ...	141
Ornamental tiles, &c.—*patent*, ...	244
P	
Paddle wheels, Doolittle's letter on Smith's and Perkins' .	309, 420
————————, Editor's remarks on them	311
Paddy, or rice, mode of preparing—*patent*, ...	90
———, or rough rice, mode of cleaning—*patent*, . . .	317
Painting in water colours, improved mode of	125
Paper, pulp dresser used in making—*patent*, . . .	308
———, substitute for glass	139
———, mode of finishing—*patent*, ...	237
——— making, antiquity of	267
——— made from wood—*patent*, ...	307
Patents, English . . .	28, 95, 163, 241, 313, 391
———, French	173
——— Laws, observations on the . . . - .	113
Pearls, making artificial	287
Percussion gun lock—*patent*, ...	86
Pen, perennial fountain—*patent*, ...	383
Phosphorus match lights—*patent*, ...	176
Piano fortes, improved mode of stringing—*patent*, . . .	159
—————, remarks on Sakmeister's improvements in - .	162
—————, making wire for—*patent*, ...	173

PAGE
Piano fortes, Sakmeister's reply to remarks on . . . 335
Piece goods, improvement in finishing—*patent*, . . 397
Pipes, cement for iron water 216
Piston, communicating vertical motion to a 39
Pittsburgh Mechanics' Institute, ... 281
Plaster of Paris, mode of making 262
Plating copper with platina—*patent*, ... 176
Polishing metals, ... 265
Platina, dark precipitate of 269
Plumbago, query concerning Mexican 288
Potts' improvement in the steam engine, . . . 42
Pots, melting, for iron and steel, ... 127
Powder, remarks concerning detonating . . . 108
Powders, fulminating, for fire arms . . . 130, 201
Preserving vegetables, &c. &c.—*patent*, . . . 95
Press, lever and pulley—*patent*, ... 377
Propelling vessels, machine for—*patent*, . . . 245
——— boats by sculling wheels—*patent*, . . 311
Pumps and cocks, alloy for 288
Pump, rotary—*patent*, ... 305

Q

Query concerning sinking an iron pot, reply to . . . 41
——— Mexican plumbago, ... 288
Queries, ... 216, 360

R

Rail-road car—*patent*, ... 379
Rail-ways, foundations of marine—*patent*, . . . 158
Rail-roads, location and construction of 178
Raising steam, apparatus for—*patent*, ... 30
Rail-way, Liverpool and Manchester, opening the . . 215
——— for loading and discharging coal, &c.—*patent*, . . 304
Refining, D'Arcet on the art of 133
Rice, mode of preparing paddy, or—*patent*, . . . 90
Rice, or paddy, mode of cleaning—*patent*, . . . 317
Rocks, on the blasting of 62
Roofs of houses, covering the 255
Ropes, &c. improvements in making—*patent*, . . . 99
Rotary pump—*patent*, ... 305
Running cap spinner, improvement on—*patent*, . . . 388

S

Saccharifying rye and other grain—*patent*, . . . 386
——— rice and maize—*patent*, ... 387
Sakmeister's improved piano forte, remarks on . . . 162
——— reply to "A Manufacturer," . . . 335
——— Editor's remarks on 359
Salt and fresh water, fountains of 286
Sea, sinking iron pot in 41
Self-operating temple—*patent*, ... 27
Ships out of water, machine for lifting—*patent*, . . 160
Shipping, copper sheathing for—*patent*, ... 172
Spongy platina, on the property of 269
Spinner, running cap, improved—*patent*, ... 388
Standing press, lever and pulley—*patent*, . . . 377
Steam, apparatus for generating—*patent*, . . . 30
——— engine, improvement in 42
——— boilers, on the explosion of . . 33, 44, 327, 332
———, fusible metal disks for 60
——— engine, on using alcohol, &c. in the . . . 68
——— boilers, detector for—*patent*, . . . 234

PAGE
Steam boilers, experiments with Braithwaite and Ericsson's . 347
——— boats, Silliman on the safety of . . . 352
——————— Sullivan on 355
——— engine, improved—*patent*, ... 398
Steel by means of silica, formation of 71
Steel, fabrication of at Sheffield 402
Stove, explosion in the drum of, Hare on . . . 337
Straw, embossed and other work in 117
Sugar, preparing cane juice for—*patent*, . . . 19
——— from the cane, making raw—*patent*, . . 21, 23
———, mode of whitening—*patent*, . . . 28
———, concentrating sirop for—*patent*, . . . 100
———, improvements in evaporating—*patent*, . . 163
———, expelling molasses, &c. from—*patent*, . . . 395
———, pneumatic process of expelling molasses from . . 405
Stock and hand vice—*patent*, ... 390
Stringing piano fortes, improved mode of—*patent*, . . 159
T
Tallow, oil, &c. mode of burning—*patent*, . . . 94
Taps and dies, notice on Editor's remarks . . . 419
Temple, self-operating—*patent*, ... 27
Thrashing wheat, &c. machine for—*patent*, . . . 303
Tiles, &c. ornamental—*patent*, ... 244
Transfers, making lithographic 138
Types and case, plan of Blake's . - . . 282
V
Vapour, elastic force of 135
Varnish, copal 72
Varley's mode of condensing brass, . . . 210
Vegetables, &c. mode of preserving—*patent*, . . . 95
Vertical motion to a piston, communicating . . 39
Vessel sailing against the wind, ... 40
Vessels out of water, lifting—*patent*, . . . 160
———, machine for propelling—*patent*, . . . 245
Vice, stock and hand—*patent*, ... 390
W
Watches and time keepers, improvement in . . . 314
Water colours, improved mode of painting in . . . 125
——— pipes, cement for iron 216
———, fountains of fresh and salt 286
Wax for candles from castor oil, ... 284
Wheat fan, improvement in—*patent*, ... 382
Wheels and pinions of glass—*patent*, . . . 385
Whitening sugar, mode of—*patent*, ... 28
Wind, vessel propelled against 40
——, cart propelled by . . . . . . ib.
Wine and other bottles, proving the strength of . . 358
Window glass, flattening cylinder—*patent*, . . . 378
Wire for piano fortes, making—*patent*, . . . 173
Windlass, improved—*patent*, ... 396
Wollaston's microscopic doublet, ... 56
Wood, making of paper from—*patent*, ... 307
Woods, extracting colours from dye—*patent*, . . 170
Wool, by felting, making garments of—*patent*, . . . 25
——, silk, and other goods, finishing—*patent*, . . 397
Writing Ink, Bostock's remarks on 208

END OF VOL. VI.